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A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE.

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ORIGINAL MEMOIRS.

SURGERY OF THE PANCREAS.[1]

WITH ESPECIAL CONSIDERATION OF TRAUMA AND INFLAMMATORY PROCESSES.

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OPERATIVE interference for disease of the pancreas is still at the present time the most incomplete chapter in the realm of abdominal surgery. It is scarcely twenty years since Gussenbauer described the first operation for cysts of the pancreas. For many years the surgery of this organ was confined to the treatment of this affection, which was a comparatively easy task so far as the technique was concerned. In regard to the other pancreatic affections, as trauma, inflammatory conditions, and new growths in the narrowest sense of the word, it is only in the last ten years that surgical treatment has been seriously undertaken. So recently as 1891 and 1892, the anatomists von Gerlach and Joessel dismissed the subject of the topographical anatomy of the pancreas in a few words, stating that the organ had no clinical interest, as it was almost impossible for the surgeon to reach it.

Still another difficulty presents itself to the surgeon who reports on affections of this organ. When we make an exception of the cystic condition, it is very seldom that one,

[1] Address delivered before the Congress of American Physicians and Surgeons, May, 1903.

with our present knowledge, has an opportunity to operate upon the diseased pancreas. Hence, the personal experience of each surgeon is only small, and a comprehensive report must rest in a great measure upon the observations of others. When I look over the notes of my own cases of pancreatic surgery during the last twelve years, I find that there are about sixty. This considerable total for a single surgeon is, however, materially reduced when I exclude thirty cases in which malignant disease of the stomach, for which I did resections, had involved the pancreas. However, the observations made in these cases are not without importance to our subject, and I shall refer to them later.

When we seek the cause of the tardy development of the surgery of the pancreas, we find we can ascribe it principally to three general reasons which we must consider carefully, as they show us that which we may expect from this branch of surgery in the future.

First, the topographical relations of the organ should be considered. The hidden and protected position of the pancreas accounts for the infrequency with which it is injured. When such, however, is the case, there usually exist severe complicating injuries of neighboring organs, and the patient very often dies either from shock or from hæmorrhage before the surgeon has the opportunity to interfere. But when the abdomen is opened in such cases, the accompanying injuries of the surrounding parts almost always demand such attention that the lesion of the pancreas is easily overlooked. Its protected position makes the technique of bringing it, or portions of it, to the surface of the body exceedingly difficult when no changes from disease are present which approximate the organ to the abdominal walls, for example, in pancreatic cysts. We possess, therefore, no such typical operative methods like those which we employ in exposing the kidney, gall-bladder, or vermiform appendix, whereby the pancreas can be made accessible, and which would be looked upon as normal methods. According to the location of the diseased part and to the enlargement of the organ in a certain direction, we are compelled

to reach the pancreas by various routes, and in this we are, moreover, hindered by the interposition of many organs that surround it.

The operative methods by which we can expose the pancreas may be divided into two general groups: first, the transperitoneal, and second, the retroperitoneal.

In the transperitoneal methods, one enters through a median or lateral incision in the anterior abdominal wall, and then either through the gastrocolic ligament, the ligamentum gastrohepaticum, or, after pushing up the omentum and transverse colon, through the mesocolon. In each case the omental bursa is opened. A fourth transperitoneal method (employed by Koerte) is to force one's way along the side of the duodenum, the peritoneal covering of which must first be incised. By this last method, of course, only the head of the pancreas can be conveniently exposed. The retroperitoneal methods aim to reach the pancreas by incisions in the lumbar region. By this means one is enabled to expose only the head or tail of the organ, and the method should therefore be employed only when through changes by disease the affected part is pushed farther to one side or is enlarged as in abscesses, cysts, or tumors.

Another difficulty which we have to contend with results from the location of the pancreas, owing to the possibility of severely injuring surrounding organs when we attempt to reach the pancreas. Besides the stomach and transverse colon, which lie in front of the pancreas, the common bile-duct, the duodenum, and the large blood-vessels demand attention; not less the middle colic artery, the injury of which is followed by gangrene of the transverse colon, a fact which Kroenlein has first demonstrated by his anatomical studies.

Another fact which has prevented the advancement of pancreatic surgery is the difficulty in diagnosis. Here, also, the concealed position of the organ is the main obstacle. The result of examination by palpation is often absolutely negative, in most cases indefinite, and, even when the organ is much enlarged and readily felt by the hand as the result of disease, the interpretation is usually uncertain.

The subjective symptoms are just as indefinite. I must not permit myself to discuss further the difficulties of diagnosis. I only wish to advance the statement that the surgeon cannot rely on the disturbance of function, in most cases, as a diagnostic sign of value. According to our experience, signs of functional disturbance in this enormously important organ do not appear until the greater portion of the gland is affected. Then the surgeon has no longer any right to interfere, for, when once a pancreatic diabetes or symptoms of severe disturbance of its fat-digesting function develop, the patient is, as a rule, beyond the help of operative measures. Experience, in fact, has shown that in affections of the pancreas, which have been treated surgically, positive functional disturbances have been observed only in rare instances. The surgeon cannot, unfortunately, watch the further course of the disease as the medical clinician does, but he must, on the contrary, decide upon the operation, particularly if it be a question of surgical interference, while the general condition of the patient is still satisfactory. So at the present time most cases are operated upon when the diagnosis is only probable, and only after the abdominal cavity has been opened can a differential diagnosis be made. As is well known, in the beginning of the era of pancreatic surgery, most operations were undertaken on a false diagnosis; to-day, as soon as an affection of the pancreas is deemed probable, it is considered wise to submit the patient to an exploratory laparotomy. This practice, fortunately, is of no great consequence, because, as a rule, when the pancreas is intact, we find other injuries or diseases present which justify laparotomy.

A third reason which has prevented the rapid development of pancreatic surgery is that the operation, so far as it includes the organ itself, is much more dangerous than an operation upon any other abdominal organ. This is partly the result of the fact that in most diseases of the pancreas, with the exception of cysts, the general condition of the patient is so low that his recuperative powers are markedly diminished.

A further danger lies in the peculiar physiological char-

acter of the gland itself. Two points come into consideration here. The pancreas is very rich in blood-vessels, and hæmorrhage from an injury is difficult to control. Simple tying of the fragile tissues is insufficient, and one must stop the bleeding with sutures deeply buried in the tissues and including much of the latter, which has the disadvantage of causing the parenchyma to necrose, thereby creating conditions which will be shortly discussed.

In spite of deep sutures and heavy ligatures *en masse,* blood and pancreatic secretions ooze into the peritoneal cavity, preventing the formation of peritoneal adhesions, which in abdominal operations in general are so important a protection. Secondary hæmorrhage into the peritoneal cavity is very apt to occur. Several operations are recorded in medical literature which seemed to promise a favorable result, but which ended fatally from this complication.

A danger much greater than that from hæmorrhage complicating operations on the pancreas is that due to the special secretion of the gland leaking from the injured parenchyma in larger or smaller quantities. The point as to whether or not this leakage is injurious was only recently definitely settled. After the experiments and experiences of recent years, we can no longer doubt that such leakage is indeed harmful. The experimental studies of Williams, Flexner, Biondi, Katz and Winkler, and others, show clearly that injuries of the pancreas, through which the vitality of a part of the organ is impaired, and the flow of pancreatic juice towards the pancreatic duct is hindered or ceases entirely, seriously affect the peritoneum and the neighboring tissues. Fat necrosis, as well as the various forms of pancreatic inflammation, from a severe hæmorrhagic pancreatitis to a chronic induration, may be experimentally produced in animals by such injuries. A number of reliable clinical observations are on record, in which, after accidental injuries, changes were present in the pancreas and the neighboring organs similar to those which we have just considered in connection with the experimental work on this subject. When death does not ensue from hæmorrhage in

such cases, a fatal result may occur from the acute, subacute, or chronic forms of pancreatitis following such injuries. I can mention in this direction the observations of Simmonds, Schmidt, Hahn, Gessner, Pressel, Sendler, Groeningen, Leith, Ziegler, and Selberg. Even after injury to the organ during operation, fat necrosis has been observed, as in Koester's case. That enormous quantities of pancreatic secretion can escape from the wound surfaces of the pancreas is proved by the interesting cases of Ruggi and Biondi, who resected a large portion of the pancreas for a malignant tumor and drained the wound.

How much worse the prognosis of an operation becomes when the pancreas has been injured is shown by my statistics of gastric resections in cases of cancer. In ninety-one cases of resection of the stomach where the pancreas was certainly not injured, twenty-five, or 27.5 per cent., died as the result of the operation. In thirty other cases the pancreas was injured. This was usually due merely to freeing the tumor from adhesions to the pancreas. The parenchyma of the pancreas, however, was exposed and communicated freely with the abdominal cavity. In other cases pancreatic lymph glands or superficial parts of the pancreas were removed. Of these thirty cases, twenty-one, or 70 per cent., died, mostly of peritonitis.*

If we ask ourselves whether the secretion from the injured pancreas leaking into the abdominal cavity can of itself so damage the peritoneum that death from this cause alone may result, we must surely admit that this is a possibility, as shown by a number of experiments and clinical observations of accidental injuries in man. The pancreatic juice mixed with blood has, no doubt, a very toxic effect and can, in the so-called apoplexy of the pancreas, result fatally without the complication of bacterial infection.

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* It might be said that the mortality of these thirty cases was high on account of the severity and length of the operation. This objection would be just, if the majority of cases had died in collapse, which was not the case. As already stated, the majority died of peritonitis.

In the majority of cases, the secretion from the pancreas —I do not refer to the normal physiological secretion, but rather to the exudate from the injured organ—does not flood the abdominal cavity in such quantities that it will prove fatal by mere absorption. It acts indirectly by reason of the local irritation of the peritoneum in that it prepares a nutrient medium for bacterial invasion and makes infection extremely easy.*

Even with the present status of our aseptic technique it is not possible to prevent all germs from reaching the abdominal cavity during laparotomy. An uninjured peritoneum will resist this infection if the germs are not introduced in certain quantities. But if the vitality of the peritoneum has been impaired by the action of the pancreatic secretions, then a very limited number of bacteria are sufficient to cause peritonitis.

There is also in every case of injury of the pancreas, the danger of a retrograde infection from the duodenum through the ductus pancreaticus. It seems, moreover, that the secretion from the injured, or also inflamed pancreas without bacterial invasion, can cause a variety of aseptic peritonitis. This is frequently followed by a paralysis of the intestines, leading to rapidly developing intestinal obstruction which often so modifies the symptoms as to lead to a serious mistake in diagnosis.

I speak of this point more in detail because I consider it

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* Not only the normal constituents of the pancreatic juice, chiefly pancreatin and steapsin, come into consideration, but also the direct degeneration products of the dead gland cells. The latter should not be confounded with the pancreatic secretion, as has apparently been done by a number of experimenters; for example, Senn decided, from his experiments in which he made an internal pancreatic fistula, that injuries of the pancreas are without special influence upon the abdominal cavity. It is not correct to assume that the juice of any crushed or powdered gland is identical with its normal secretion. A large number of investigators have observed that when the excretory duct of the pancreas is ligated, and retention of the glandular secretions results, the typical signs of fat necrosis of the pancreas do not appear. This is explained by the fact that the normal or nearly normal secretion is carried away in the lymph and blood stream, where its ferments are rendered harmless, as the investigations of von Nencki and Tschepurkowski have shown.

of great importance in pancreatic surgery. For whatever operation may be done on the pancreas, we must take the greatest pains to keep the secretion of the injured gland from getting into the abdominal cavity. This can be done in two ways: first, one can turn the injured part inward and close it with deep sutures so that the peritoneal covering is again in continuity. Ninni used this method with good results in a gunshot wound. As a rule, however, this will not be possible, or, at least, will not offer a sufficient protection against leakage of the pancreatic juice into the peritoneal cavity. Nothing more can be done in these cases than to protect the latter by means of tampons reaching down to the exposed pancreas.

The value of this tampon drainage is demonstrated to-day by the limited number of wounds of the pancreas which have been operated upon. Of twelve injuries, partly the result of blunt force, of stab or gunshot wounds, eight were drained.* Of these six recovered and two died. Of the four undrained cases, three died, only the previously quoted case of Ninni recovering.

When capillary drainage of wounds of the otherwise healthy pancreas is so important, there can be no doubt of its greater value in operations upon the diseased organ. This obtains not only in acute and chronic inflammatory conditions due to bacterial infection, but also in certain aseptic lesions which present themselves to us clinically as pancreatic apoplexy in the most acute cases, or in the more chronic as pancreatic cysts. The admixture of blood to the pancreatic secretion in the peritoneal cavity renders the condition more serious. We see, therefore, that when patients survive the acute stage of the disease, whether septic or aseptic, this is accomplished only

* These are the cases of Hahn, Deutsche Zeitschrift für Chirurgie, Band lviii, 1901. Küttner, Beiträge zur klinischen Chirurgie, Band xxxii. Villiere, Bulletin de la Société Anatomique de Paris, Band lxx, 1895. Rose, Deutsche Zeitschrift für Chirurgie, Band xxxiv, 3, 36. Hadra, New York Medical Record, 1896. Von Mikulicz, Vierteljahr-Schrift für gerichtliche Medicin (3), xviii, 2. Michaux, XIII Internationale Medicinischer Kongress zu Paris. Cushing, ANNALS OF SURGERY, p. 69 (1898), page 337.

through the walling off of the focus of disease by peritoneal adhesions.*

I have attempted to collect all operations for acute disease of the pancreas to determine, if possible, the value of drainage also in such cases. I have succeeded in finding thirty cases. In twenty-seven of these, it is distinctly stated that the exposed pancreas was drained; of these, eleven, or 38 per cent., died. In the remaining number, either no drainage was established, or exact statements are lacking. Of these, forty-one, or 80 per cent., died.†

From these statistics, we should conclude that wherever the pancreatic tissue has been exposed at all, the abdominal cavity must be tamponed, and drainage established.

After these general remarks, we will proceed to the special part of our subject. We can divide pancreatic diseases which concern the surgeon into three great groups: (1) Injuries; (2) inflammatory processes; and (3) new growths.

In the second group I would include also pancreatic apoplexy and pancreatic calculi; in the third group we will place in addition to tumors, as is generally customary, the pancreatic cysts which, although in a great number of cases of traumatic origin, in others are certainly due to small apoplexies or to an inflammatory condition.

As I have repeatedly spoken of the injuries of the pancreas, I can now be more brief, particularly as the number of cases on record is even, at the present time, very small. The

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* Recently Pierre Achalme has made experimental studies on the action of pancreatin in the peritoneal cavity. He tried to discover whether the blood serum of the animal experimented upon did not possess some antifermentative virtue, and if it could produce immunity when given in increasing doses. He was not only successful in rendering animals thus treated immune against toxic doses of pancreatin, but also in obtaining a serum that immunized other animals. Perhaps a serum acting similarly on human beings might be obtained. This would enable us to protect the patient to be operated upon against the harmful effect resulting from absorption of his own pancreatic secretions.

† In the last category, it is possible that a number of drained cases are included, and therefore the resulting mortality turns out too favorable.

problem presented to the surgeon by an injury of the pancreas to-day is very clear. We have first to stop the hæmorrhage, and secondly, to prevent, as much as possible, the flow of pancreatic secretion into the abdominal cavity and the subperitoneal tissues. The first and, to some extent, the second problem will be solved by deep sutures and ligatures *en masse*. Where a break in the continuity of the organ through a stab or gunshot wound occurs, we close the wound with deep sutures, and thereby best control the bleeding and leakage of pancreatic secretions. When the pancreas, as usually happens by the action of blunt force, is not simply torn but crushed, these means will not be sufficient.

Here, as in all unsutured wounds of the pancreas, we must of necessity use the tampon to overcome the dangers previously discussed. Even when the wound is sewed, tamponing is to be recommended, especially when neighboring portions of the stomach or intestines are injured, this being a frequent complication. In spite of prompt suturing of wounds of the stomach and intestine, the danger of peritonitis is very great.

The diagnosis of these cases can rarely be made with any degree of certainty. The difficulties which we contend with in this respect are so great owing to the fact that in most cases the neighboring organs are also injured. In cases which come under observation very soon after injury, we can only suspect a lesion of the pancreas. The surgeon must, however, always bear in mind the possibility of injury to the pancreas in all cases where the force has acted upon the epigastric and umbilical region. He must always direct his attention to the pancreas if, after opening the abdomen, he finds a lesion of another organ, such as the stomach. We often find cases reported where, wounds of the stomach or intestines having been sutured, death has occurred from an undetected wound of the pancreas.

With the uncertainty of diagnosis it is best to make the incision, as a rule, in the median line above the umbilicus. This is also true for penetrating wounds which lie some distance from the median line. From this median incision one

can best determine what changes are present in the peritoneal cavity, and can enlarge the incision above, below, or to one side, as needed, exposing the injured pancreas according to the location of the injury. Then we can proceed as in wounds of other abdominal organs. I want, in this connection, to mention the great importance of thoroughly washing out the peritoneal cavity with warm normal salt solution (0.9 per cent.).

I have found in all forty-five cases of pancreatic injury, twenty-one penetrating wounds and twenty-four subcutaneous wounds from blunt force. Of the twenty-one penetrating wounds, twelve were of gunshot origin and nine were stab wounds. Of the gunshot wounds, five were operated upon, two dying and three recovering. (The cases of Otis, Hahn, and Ninni.) The seven that were not operated upon died. The nine stab wounds were all operated upon, one dying and eight recovering. This remarkably favorable percentage of recovery in the stab wounds is to be explained by the fact that, in seven cases, the pancreatic injury was really a prolapse, and in some of these cases only a very minor lesion of the prolapsed portion was present. The evil consequences of injuries to the pancreas within the peritoneal cavity could therefore not follow. The operation in seven cases of pancreatic prolapse consisted in excision of the dislocated portion in five cases and reposition in the other two cases. An intra-abdominal punctured wound of the pancreas occurred only in the cases of Hildebrand and Küttner. In the latter recently published case, the organ was almost completely divided in an anteroposterior direction. Küttner united the divided pancreas by means of two deep and one superficial suture; the hæmorrhage stopped at once; then a wound in the stomach, nine centimetres long, was sewed up, and finally the omental bursa was drained with a tampon. The case recovered, even though it was complicated by the formation of a subphrenic abscess.

In Hildebrand's case there was also a perforation of the stomach in addition to the injury to the pancreas. The wound in the stomach was sutured and the bleeding vessels of the pancreas were ligated. No drainage was established, and the patient died four days after laparotomy.

Of the twenty-four subcutaneous injuries, thirteen were not operated upon and all died. Of the eleven operated on, seven recovered. Three cases were operated upon early, within four days after the injury. One of these recovered (Hadra) and two died (Villiere, Michaux).

The operation consisted in exposing the injured pancreas and in drainage; eight times the operation was done late. After one or more weeks the hæmatoma arising from the pancreatic wound was opened and partly drained. Two cases died (those of Braun and Czerny) and six recovered (the cases of Rose, Mikulicz, Stern, Lissjanski, Michailow, Cushing, and Kuhlenkampf).

These figures include only the severe contusions of the pancreas in which the diagnosis was confirmed by autopsy or by an operation undertaken sooner or later. There is, therefore, no doubt that not infrequently slight contusions of the pancreas result from injury which either heal spontaneously or cause only minor disturbances. We must assume this possibility from experiments on animals. The cases in which traumata play an important rôle in the etiology of the different forms of acute and chronic diseases of the pancreas also teach us this lesson. This is especially the case in pancreatic cysts, of which about one-fourth are of traumatic origin, or, at least, referable to traumatic hæmatomata. Not every injury of the pancreas justifies a bad prognosis, nor does it warrant us in assuming that immediate recourse should be had to operative interference. The indication for operation does not only depend upon the diagnosis of an injury to the pancreas itself, but also upon the severity of all the symptoms, especially and particularly the steady accentuation of such symptoms. These symptoms are increasing anæmia, the physical signs of blood in the abdominal cavity, and peritoneal irritation. An injury to neighboring organs can frequently occasion the same symptoms, as I have previously stated, and, as a rule, it is not important to diagnose that the pancreas itself is injured. The diagnosis of an abdominal injury which can result in the death of a patient from hæmorrhage and peritonitis is in general suffi-

cient. No definite rules can therefore be laid down as to whether one should await further developments or proceed immediately to laparotomy in any given case. The suspicion of a severe injury to the pancreas should encourage us to act quickly.

The figures previously mentioned, small as they are, teach us that severe injuries to the pancreas, which are not submitted to operation, terminate fatally almost without exception. They also teach us, in view of the favorable results obtained up to the present time, to make an exploratory laparotomy whenever there is a question of severe pancreatic injury.

We will now proceed to the inflammatory lesions of the pancreas.

A very excellent pathological classification of acute pancreatitis by Fitz has stimulated further research on the subject. That author divided pancreatitis into the hæmorrhagic, the suppurative, and the gangrenous varieties. This division is, however, not the best for the clinician. These three forms of pancreatitis, easily differentiated as they are in typical cases, merge into one another in most instances, or follow each other in succession. Even pancreatic apoplexy is very difficult to differentiate from hæmorrhage pancreatitis.

Furthermore, the acute and subacute forms of pancreatitis frequently border on chronic pancreatitis. I should, therefore, rather accept the classification of Robson from the clinical stand-point of acute, subacute, and chronic pancreatitis. The classification of Fitz into hæmorrhagic, suppurative, and gangrenous pancreatitis rather represents different stages of the disease, with a common etiology.

Let us now turn to acute pancreatitis, and first of all inquire if it is purely an infectious process, and whether it is exclusively the result of an invasion of bacteria. Without doubt, bacterial infection in acute pancreatitis plays an important rôle, but it does not alone explain the singularly severe symptoms. In this connection, the cases of genuine pancreatic apoplexy, which run their course as an acute hæmorrhagic pancreatitis, are of great importance. As is well known, a severe

hæmorrhage from the pancreatic and retroperitoneal cellular tissue occurs in these cases, as the result of a peculiar dyscrasia of the patient, accompanied by hæmorrhagic peritoneal exudation, which is not of bacterial origin.* That a hæmorrhagic diathesis, or that other predisposing factors, as alcoholism, arteriosclerosis, syphilis, or fatty degeneration of the organ in obesity, play a great rôle, is not to be doubted, but does not explain the nature of the process. If we look for an analogous condition, we find it, as the term "apoplexy" expresses, only in the spontaneous hæmorrhages in the brain, but here the severe local reactions are missing.

There can be no doubt that there is in addition to the hæmorrhage some special cause for this phenomenon. We may not be amiss in attributing it to the action of the pancreatic and fat-splitting ferments upon the gland, which is the seat of an hæmorrhage or has been otherwise injured.

As a result of a slight blow, the following vicious circle may develop not only in those unusually rapidly fatal apoplexies, but also in small and harmless hæmorrhagic foci (of traumatic and non-traumatic origin): small hæmorrhages or disturbances in circulation (from arteriosclerosis, embolus, thrombosis); from this necrosis of a small area of the gland; infiltration around this focus of the ferments set free by the destruction of the parenchyma cells; digestive changes in the surrounding tissue and its vessels which were, until this time, unchanged; enlargement of the hæmorrhagic focus, partly as a direct result of the erosion of the vessels, and partly as the

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* Hlava found that in so-called pancreatitis acuta, the hæmorrhagic exudate in the pancreas, as well as the peritoneum, was sterile. In medical literature the terms "'pancreatic apoplexy" and "acute hæmorrhagic pancreatitis" are frequently confounded, which can be explained by the great similarity of the clinical course as well as the anatomical findings in both affections. My opinion is that a sharp differentiation can only be based upon a bacteriological examination. The one is an aseptic, the other a septic process. The possibility of transitional forms lies in the fact that an infectious pancreatitis assumes a severe hæmorrhagic character as the result of a dyscrasia similar to that which we see in a pure pancreatic apoplexy.

result of the undermining of the tissues and the increased pressure from the hæmatoma; necrosis and destruction of the surrounding parenchyma of the gland; further escape of the ferments, etc. The tendency to successive enlargement of all existing hæmorrhagic foci is present beyond doubt. It has already been mentioned in speaking of the difficulty with which traumatic hæmorrhage from even small vessels of this organ is controlled.

Whether a primary focus involves only a small area and heals naturally; whether it slowly enlarges and later, after weeks and months, forms a pancreatic cyst, or finally gives rise to pancreatic apoplexy, depends on the resistance of the vessels and the interstitial connective tissue (fatty degeneration of this tissue is known to be a predisposing factor); upon the digestive activity of the escaping ferment, and, finally, upon the anti-fermentative property of the blood serum and the other body fluids.

I should like to emphasize the fact that in true pancreatic apoplexy, owing to the existing serious constitutional dyscrasia, a surgical procedure would hardly be warranted. As it is difficult, clinically, to distinguish these cases from cases of acute pancreatitis, it will occasionally happen to the surgeon to operate upon the former under a mistaken diagnosis.

If the pancreatic ferments play so important a part, even under aseptic conditions, we can readily understand their intensified action on the tissues when combined with bacterial infection. That these ferments are really of such importance in the development of acute pancreatitis is shown by the frequent occurrence of fat necrosis accompanying this disease. The characteristic features of acute pancreatitis are due, therefore, to the action of the pancreatic ferments.

The surgeon has little interest in the nature of the bacterial infection of the pancreas when the latter is only a part of a general systemic infection. Surgical interference is indicated particularly in those cases in which the pancreatitis is a purely local condition. This, according to our present knowledge, is very often the case. We know to-day, thanks to the researches

of Robson, Opie, and Koerte, that the pancreatic duct, like the common bile-duct, is easily infected from the duodenum. The surgeon should always bear in mind that acute and also chronic pancreatitis often follows cholelithiasis and cholangeitis, as the infection travels from the bile-duct through the ampulla Vateri in a backward direction to the pancreatic duct. Opie has established the fact that a gall-stone can be caught in the ampulla Vateri and close it. Then under favorable anatomical conditions it can produce a retrograde flow of infectious bile into the ductus pancreaticus. Pancreatic calculi can of themselves cause a similar irritation. This, however, in contradistinction to gall-stones, seldom occurs.

The surgeon will accordingly bear in mind the following points in considering the etiology of acute pancreatitis:

1. The very slight tendency of pancreatic hæmorrhage to stop spontaneously.

2. The locally destructive and the general toxic action of the pancreatic ferments set free by the inflammatory and hæmorrhagic processes, and, finally,

3. The ease with which the pancreas may be infected from the ductus choledochus.

If these propositions are correct, I believe that the course of the surgeon, in order to master the situation, is clear.

We may consider acute pancreatitis as an acute phlegmon which, on account of the peculiar nature of the tissue, runs an unusually severe course. As in an ordinary phlegmon, so in the pancreas, the only rational therapy is to open the focus of infection with the knife and to empty and drain the toxic and infectious exudate. Gauze tampons will best combat the fatal tendency to hæmorrhage.

Of course, there are different degrees in the intensity of this process, just as in ordinary phlegmon, where we meet the most severe form of general sepsis as well as the most harmless furuncle. In such cases the surgeon will often refrain from operation when neither the general system nor important tissues or organs in close contact with the infected area are in danger of infection. But when the infection threatens to

spread to vital organs, the surgeon will not dare to rely on spontaneous absorption or wait for the formation of a typical abscess. He must unhesitatingly proceed to lay open the focus of infection with the knife.

Such considerations, I should think, answer the question as to the expediency of surgical interference in the first,—the most acute stage of pancreatitis. We should not in general allow the severe symptoms to pass and delay the operation until the formation of an abscess.

To continue the comparison between acute pancreatitis and acute phlegmon, we can hardly conceive of a region in which the focus of infection could be more unfavorably placed. Not only is the patient threatened with severe toxic and general septic symptoms, but he is also exposed to the danger of a progressive general peritonitis. This is especially likely to develop in the subphrenic space, giving rise to subphrenic abscess. There is also the danger of formation of a phlegmon in the loose tissue of the retroperitoneal region, which is rich in lymphatics. From this, again, other complications arise, such as pyæmia, a phlebitis, or even a pleurisy. Most surgeons, even at the present time, are more or less opposed to early operation in acute pancreatitis, and clinical experience seems to justify their disapproval, for the results of early operation are not as good as those which follow later surgical interference.

Of the cases I have collected, only nine out of forty-six operated upon in the acute stage recovered. On the contrary, eighteen out of thirty-five recovered when the operation was done during the later stages of the disease. I believe, however, such statistics are of no great value.

First of all, we do not know, from statistics available at present, how many of these patients with acute pancreatitis really survive the acute stage and go on to the subacute, the most favorable stage for operation. I believe that comparative statistics in this regard will show that the great majority of the patients die in the acute stage. The possibility that a goodly number could be saved by means of a rationally conducted early operation cannot at the present time be denied. I say purposely

"a rationally conducted" operation, for the operations done up to the present time for acute pancreatitis were not all rational procedures. As we know, most cases have been operated upon under a false diagnosis, and the disease has not even been recognized at the time of operation, the surgeon being compelled to close the abdomen without having relieved the condition of his patient. The post-mortem examination in these cases has first shown the true condition. The operation was usually done, a diagnosis of perforative peritonitis or intestinal obstruction having been made. The suspected perforation or occlusion was looked for; the operator thoroughly explored the abdomen; in many cases the intestines were eventrated, and finally the abdomen was again closed. As a rule, an anæsthetic had been given the patient. It is certain that by such procedures the patient was greatly harmed and not at all, or very little, helped. The evacuation of the hæmorrhagic peritoneal exudate alone was of some value.

Only in recent years, since surgeons have learned to recognize the ominous symptoms of fat necrosis and to refer them to an affection of the pancreas, they have ceased to make a thorough search among the abdominal viscera. Most surgeons to-day still close the abdomen when they have satisfied themselves of the existence of fat necrosis, in the conviction that the patient cannot be saved. Only a few surgeons are in favor of active and direct interference with the pancreas.

Nimier has proposed incising the pancreas in acute pancreatitis and introducing a tampon. Later on, Robson recommended early operation, making a small incision below the umbilicus, and, if necessary, a counter-incision at the border of the ribs for thorough drainage. In a similar manner, Lund recommends an incision above the umbilicus, splitting the gastrohepatic ligament, and thus securing free drainage of the omental bursa. When necessary, the vault of the diaphragm may be exposed, and drained by resection of the tenth and eleventh ribs.

I fully agree with these surgeons, for the reasons which I have previously mentioned. We should, at least, try such

methods before admitting that we are powerless in all cases of acute pancreatitis.

The indication for laparotomy in these cases is more readily found by the surgeon, as he cannot in any given case make the differential diagnosis between an acute pancreatitis and other diseases calling for surgical intervention, such as acute perforative peritonitis and acute intestinal obstruction. He must in all such doubtful cases think of the possibility of acute pancreatitis. He will be able to make his diagnosis after opening the abdominal cavity and finding a hæmorrhagic exudate, upon determining the presence of fat necrosis, and by manual examination of the pancreas.

Having assured himself of these conditions, he should then proceed systematically, instead of terminating the operation at this time, as was formerly done. Cases of this kind, however, offer great difficulties, and we have yet to learn by experience which procedures will produce the slightest amount of surgical shock in the much-enfeebled patient, while still accomplishing the object for which they were undertaken.

In this connection, I will mention a case of Hahn's (*Deutsche Zeitschrift für Chirurgie,* Vol. lviii, page 1, 1901), in which that surgeon made an incision below the umbilicus, using local anæsthesia, and, after diagnosing an acute pancreatitis, confined himself to merely evacuating a large hæmorrhagic exudate and draining the abdomen with iodoform gauze. The fortunate issue in this case should encourage us to imitate this procedure in all those cases in which, owing to the weakened condition of the patient, it is inadvisable to explore the pancreas itself.

But Hahn's case is not the only one of its kind. As early as 1889, Halsted observed a recovery in a case of acute pancreatitis with fat necrosis of the omentum and mesentery where only a laparotomy and removal of peritoneal exudate were done. The operation was undertaken in the belief that the case was one of acute intestinal obstruction. Four years after operation a similar attack occurred in this patient.

Another case was operated upon by Pels-Leusden in 1901

in König's clinic under similar conditions and with a successful result. The peritoneal cavity was drained.

Finally, Henle, three years ago, operated upon a case in my clinic in which the diagnosis of acute intestinal obstruction had also been made. After demonstrating the presence of an extensive fat necrosis in the omentum, a large peritoneal exudate was removed. An artificial anus in the cæcum was established to relieve the condition of intestinal paralysis. The patient recovered and the artificial anus was closed six weeks later. In the course of the following year similar attacks recurred, but these were always less severe and subsided after high enemata.

This small number of favorable results does not allow us to draw binding conclusions regarding the efficiency of these operations. One could infer that the patients recovered not because of, but in spite of the operation. I believe, however, that even at the present time the following can be stated in favor of surgical interference:

1. The operation according to Hahn, under local anæsthesia, can be performed so easily that we can employ it even in collapsed patients without running any great additional risks.

2. Emptying of the peritoneal exudate and thorough flushing of the abdominal cavity with a 0.9 salt solution are surely of great benefit to the patient, more especially when the peritoneal cavity is later on drained.

3. An artificial anus, according to Henle, should be established only when intestinal paralysis exists.

Whether or not we will in future secure such favorable results with the methods already in use, as were obtained in the four cases of Halsted, Hahn, Pels-Leusden, and Henle, further experience alone will show. It must particularly demonstrate whether the simple operations, which do not directly include the pancreas itself, are sufficient not only to remove the symptoms of intoxication, but also to check the further development of the disease. *A priori,* one must consider an incision into the pancreas followed by drainage as a rational treatment in acute pancreatitis, even as in an acute

phlegmon we make deep incisions to remove tension and expose the focus of infection, or as we open the medullary canal by trephining in the severe septic forms of osteomyelitis before the formation of real pus. The statistics up to date, in spite of these four favorable cases, as far as we may judge, show that an operation which does not disturb the pancreas, favorable as its influence may be on the general condition, does not help materially in combating this terrible disease.*

By active interference in the acute stage, we not alone desire to overcome the septic condition to which most of the patients succumb, but also to ward off necrosis and sequestration of large portions of the gland occurring in many cases. Even should the surgeon be able to remove the disintegrated portions of the gland, the loss of a considerable amount of pancreatic tissue might prove a serious matter to the patient later on. Among the cases of pancreatic necrosis which have been operated on with a favorable result, we find many in which the patients have succumbed to increasing emaciation and pancreatic diabetes from a loss of function of the gland.

So far I have considered only the case of acute pancreatitis, and, speaking generally, I have ventured the opinion that they should be subjected to surgical interference. As I have already stated, this seems to me eminently proper, as a differential diagnosis between acute pancreatitis and other diseases, which also demand immediate laparotomy, is hardly possible.

We must judge the *subacute* forms of pancreatitis somewhat differently. Cases occur in which the first fulminating attack disappears rapidly, or in which the disease begins insidiously at the outset, only gradually developing severe local and general symptoms. Here the surgeon has time to observe his case more carefully, and to consider the advisability of com-

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* I have collected seventy-five operations for acute pancreatitis which were performed in the early as well as the late stages of the disease. Of thirty-seven cases in which the pancreas was involved in the operative interference, twenty-five recovered; in forty-one, where the pancreas was not touched, four cases recovered (the cases of Halsted, Hahn, Pels-Leusden, and Henle).

bating the attack without surgical interference; indeed, a delay in most of these cases is not inopportune, as the diagnosis is still more uncertain than in acute pancreatitis.

Chronic inflammations of the pancreas were not regarded as suitable for surgical treatment until a short time ago.

It was first shown by the observations of Riedel, Koerte, Lancereaux, and Hardin, and more especially by the careful work of Robson, Halsted, and Opie, that cases of chronic pancreatitis, which otherwise had seemed hopeless, were not only improved, but also completely cured by operative means. We have learned two things, above all others, in the last few years: first, that chronic pancreatitis runs a course not dissimilar to that of pancreatic carcinoma and has often been mistaken for the latter, and, second, that active interference has often been postponed because we have been unable, as just stated, to properly recognize the condition of chronic pancreatitis, and have confounded it with a condition beyond surgical relief. It is easy to understand how the clinical symptoms of both affections, especially in disease of the head of the pancreas, could show a resemblance. But even after opening the abdomen, the differential diagnosis can often not be made by palpation, since in both cases the diseased portions of the pancreas present a hard, irregular mass enclosed in the gland. Only recently, in a case of that nature, with closure of the common bile-duct by the indurated head of the pancreas, I did a cholecystenteroanastomosis in the belief that I was dealing with a carcinoma. When the patient died ten days later of pneumonia, I learned from a microscopical examination that I was dealing with a case of chronic pancreatitis. In several other cases, during my earlier experience, I have made a diagnosis, with or without operation, of carcinoma of the pancreas, and have in consequence given an unfavorable prognosis. In these cases the patients have recovered. The diagnosis should, of course, have been chronic pancreatitis.

Another no less important point, to which Koerte, Robson, and Opie have called attention, is the close relation existing between chronic pancreatitis and diseases of the biliary tract.

Gall-stones which become impacted near the papilla Vateri, even though small, have an important bearing upon the development of chronic as well as acute pancreatitis. Infection arising from a cholangeitis may spread through the pancreatic duct to the pancreas. On the other hand, a chronic pancreatitis of the head of the pancreas can easily simulate a cholelithiasis by compression of the common bile-duct.

From what has been said, it is evident that chronic pancreatitis must always be considered in making a diagnosis of cholelithiasis; and, further, that with gall-stones and cholangeitis, especially when the common duct is involved, one must be prepared to find a lesion also of the pancreas.

Barring the cases of chronic pancreatitis already discussed, pancreatic calculi are found only in very exceptional cases.

The surgeon should always bear in mind the possibility of a pancreatitis developing as the result of a chronic intoxication (alcohol) analogous to the development of cirrhosis of the liver.

Owing to the uncertainty of the diagnosis of these conditions, an operation should always begin as an exploratory incision. Only after establishing the diagnosis on a firm basis, by local examination, is the surgeon enabled to further develop his plan of operation. He must choose between two ways: he must strive to remove the cause of the disease; this he will do when he finds impacted concretions in the common bile-duct, the papilla Vateri, or Wirsung's duct. The technique of all these operations is not unlike that of cholelithiasis.

As impacted calculi generally give rise to an infectious cholangeitis or an inflammation of the pancreatic duct, drainage, as a rule, of one or both ducts must be provided. One should also drain the neighboring portions of the peritoneal cavity with tampons.

The second way is more indirect, inasmuch as only a free outlet for the confined and infected bile is established. This can be done through a gall-bladder fistula by means of a cholecystotomy when the cystic duct is free, or by establishing a communication with the small intestine by means of a cholecys-

tenterostomy. Both operations have their advantages and disadvantages.

The technique of the first is more simple, and does not permit a permanent infection of the bile-tract from the contents of the intestine. It has the disadvantage that the patient is burdened for a long time with an external fistula, the closure of which may prove difficult. The question as to which of these two operations is preferable has not yet been answered by clinical experience. I want, however, to emphasize that the importance of a retrograde infection of the bile-tract from the intestinal fistula is by no means so great as it may at first appear; this, at least, the experimental work of Radziewski, done in my clinic, would indicate.

The danger of infection is greatly diminished when the plan which I recommended in these cases is employed. After cholecystenterostomy an entero-anastomosis is immediately added at a distance of about ten centimetres from the original anastomosis, which deflects the intestinal circulation from the loop in connection with the gall-bladder.

I should also recommend that the surgeon do not hesitate too long in operating for chronic pancreatitis, as severe disturbances of nutrition can occur following gradual degeneration of the organ. Of course, when only mild symptoms are present, one will not resort to the knife at once, but rather recommend internal medication.

The results of operation at present in chronic pancreatitis are very encouraging. If I include twenty-two cases of Robson, in which there was only one death in connection with the operation, I find thirty-six cases reported, of which thirteen recovered and five proved fatal.

One can treat the subject of surgical interference for pancreatic calculi very briefly, as they are known to be very rare, and, consequently, no very detailed accounts of the experience of surgeons with them are available. I find reports of two cases, both of which died following operation. In one of them the stones were removed from the head of the pancreas and the ductus Wirsungianus. In the second a cholecystentero-anasto-

mosis was done, as a diagnosis of pancreatic calculi was not previously made.

Since a pancreatic stone does not give rise to any characteristic symptoms, and is only recognized as such when passed in the fæces, the surgeon is only concerned with the secondary changes which its presence may cause. These will arise from a blocking of the pancreatic duct or its branches, and will become evident from an accompanying chronic or subacute pancreatitis. The surgeon will find an indication for interference only if symptoms of pancreatitis are present. In all such cases, therefore, we should also remember the possibility of the presence of calculi.

I will now briefly give my personal experience in the field of pancreatic surgery. The thirty cases in which I have had the opportunity of operating upon the pancreas while performing a resection of the stomach for cancer, I have already considered.

Besides these, during the twelve years that I have been in Breslau, I have operated on the pancreas thirty times; ten of these were typical pancreatic cysts, of which two were removed and eight were incised and drained. All recovered.

A subacute pancreatitis occurred twice among these cases, once leading to abscess formation and the second time giving rise to fat necrosis. The abscess healed after incision. The other patient was the one before mentioned as the case of Dr. Henle, who was restored to health after a preternatural anus had been established. He was successfully operated upon without disturbing the pancreas. A case of chronic pancreatitis, also previously mentioned, died of pneumonia ten days after a cystentero-anastomosis. In a case which was mistaken by me for carcinoma, the patient lived four years after the laparotomy.

In one case of contusion of the pancreas, the result of blunt force, twenty-four days after the lesion, an immense hæmatoma was opened and drained. The case recovered. This case was also mentioned before.

I have observed fifteen malignant growths involving the pancreas. In these exploratory laparotomy was done seven

times and cholecystenterostomy five times. Of the latter, one died as a result of the operation.

Once a gastro-enterostomy was done for a stenosis of the duodenum due to a pancreatic tumor.

Once drainage for a softened tumor which was taken for a cyst was made, and

Once extirpation of a tumor in the head of the pancreas was done. All three cases ended fatally.

Post Scriptum.—A week after I had read my paper before the Congress at Washington, I had the privilege of seeing a case of acute pancreatitis in the Massachusetts General Hospital in Boston, which had been operated on by Dr. C. A. Porter with an excellent result. In this case, for the first time to my knowledge, multiple deep incisions were made into the substance of the pancreas, to relieve tension, in the manner which I have suggested in the present paper. As this case marks the first practical application of a definite surgical principle in acute pancreatitis, I take the liberty of adding a history of the same, as kindly furnished me by Dr. Porter.

S. P., aged thirty-six years, salesman, entered the Massachusetts General Hospital, February 17, 1903, as a patient of Dr. C. A. Porter.

History.—Patient had previously entered the hospital on October 30, complaining of dull pain in the right hypochondrium for the past seven years, and chronic constipation. A year ago, he was seized with sharp pain in the epigastrium, which later localized itself in the right iliac fossa. The pain was constant and very severe. No vomiting, no chill; had never been jaundiced. Examination at that time showed the abdomen to be tender, especially in the region of the gall-bladder, where there was some rigidity. Under rest in bed, in five days the patient was discharged relieved, to report again.

From November 5 until re-entry on February 17, patient had had several attacks of severe pain in the upper abdomen and right hypochondrium. A month ago he had slight jaundice, and a diagnosis of gall-stones was made. On February 15 patient suffered from a sudden and severe abdominal pain in the epigastrium

and right iliac fossa, was nauseated, but did not vomit. Morphine gave relief. Pain continued, and has steadily increased; is now general throughout the abdomen, somewhat more marked in the right hypochondrium and flank. Last night patient began to vomit, and this has become continuous. Bowels moved once after an enema.

Examination showed a somewhat emaciated man, evidently in great pain and distress. Skin was moist, slight dyspnœa. Patient is vomiting continuously, thrashing about in the bed. Vomitus, brown, sour-smelling, not fæcal, no blood. Abdomen moderately distended. Greatest pain referred to the right costal border and epigastrium, next to the right iliac fossa. No visible peristalsis. Rigidity moderate. Less marked in the epigastrium and the right iliac fossa. Deep pressure in the latter region causes pain and increased rigidity. Examination of epigastrium impossible, owing to rigidity. Abdomen tympanitic in centre, flat in both flanks, dulness shifts readily, therefore free fluid is present. Temperature, 100° F.; pulse, 100, of poor quality; respiration, 30; leucocytosis, 8000. At the time, a diagnosis was made of probable intestinal obstruction from a band in connection with an old inflammatory process about the gall-bladder or appendix.

Ether was given, and a median incision from three inches below the ensiform cartilage to two inches above the pubis, through the right rectus muscle. On opening the abdominal cavity, large amounts of brownish, red fluid emerged. This fluid was clear, and evidently colored by blood. Culture made reported sterile. The intestines were everywhere injected. No tumor or band could be found, and no especially distended coils of intestine. Examination of the appendix showed that it was large and injected, but not gangrenous. Disseminated throughout the abdomen were numerous areas of fat necrosis, which varied in size from a pinhead to a split pea. The fat necrosis in the meso-appendix was especially well marked. The appendix was removed.

Examination of the gall-bladder showed a few adhesions, and that it was slightly distended with bile. Examination of the pancreas showed it to be enlarged to three times its normal size, very hard and tense. After thorough irrigation of the abdomen with salt solution, the median incision was closed, and an incision along the left costal margin, five inches long, made. With deep retractors the ribs were held upward, the small intestines and stom-

ach were packed with gauze upward, and towards the median line. Examination of the pancreas was made through the mesentery of the transverse colon. From the spleen to the duodenum the pancreas was very large, tense, and œdematous, of a deep purplish color. No stones could be felt in the duct. It seemed evident that the diagnosis of acute pancreatitis required proper drainage, therefore an incision was made through the mesentery from the median line to the tail of the pancreas. This incision was about four inches long and three-quarters of an inch deep. Several areas of fat necrosis were found in the peripancreatic tissue. A rubber tube was placed up to the pancreas, and all of the intestines were carefully walled off with gauze sponges.

Recovery after operation was rapid. Vomiting stopped, the patient had far less pain, there was no fever, no increase in the white count, and the pulse soon fell to 80. At the end of a week the gauze was changed, and the wound appeared healthy. On the twelfth day, two small pieces of gangrenous fat tissue came away. The gauze was changed three times a week, and the wound rapidly granulated and healed. Throughout the convalescence, the leucocytosis never rose above 10,000. There was no distention, the bowels moved normally.

Urinary examination showed interesting conditions. Immediately after the operation, a slight trace of albumen, with granular casts. On the 23d of February, bile in large amount, few casts, also 1.4 per cent. of sugar. On the 26th, sugar was absent, albumose present in small amount. By March 2, the urine was normal, except for an increase of indoxyl and kreatinin. Numerous experiments were made with salol, feeding with a large amount of grape sugar, etc., and investigation of the stools for undigested fat. All of these tests showed nothing abnormal.

On April 1, the patient was up and about, and had gained much in color and general health. Convalescence seemed perfect.

About the middle of April, however, he complained from time to time of pain in the epigastrium, above the umbilicus. There was no fever, no increase in leucocytosis. The bowels had not been acting very well.

In view of the persistence of this pain, it seemed wise on April 17 to operate again, in order to find out whether a stone were impacted in the common duct, and if none were found, it was planned to drain the gall-bladder. On April 17, a five-inch

incision was made along the outer border of the rectus muscle, from the rib margin downward. On opening the cavity, adhesions were discovered between the omentum and the anterior abdominal wall. The gall-bladder was found to be much thickened, but not distended. Numerous adhesions about it showed evidence of an old inflammation. The duodenum was separated from behind; with one finger in the foramen of Winslow and another behind the duodenum, the whole biliary passages were examined. No stones could be felt, but the common, cystic duct, and gall-bladder were markedly thickened. The pancreas had again resumed its normal size and feel, except in the head, where some induration was present. No evidences of fat necrosis had remained behind. Finally, it seemed best to make a small incision by tearing between the stomach and the transverse colon. With one finger in the lesser peritoneal cavity, and the others behind the duodenum and pancreas, careful palpation revealed a slightly fluctuating area in the head of the pancreas, about two centimetres in diameter. This was incised through the lesser peritoneal cavity, and a teaspoonful of broken-down débris evacuated. Cultures from this were sterile. A finger-tip placed in the cavity could feel no stone. This cavity was curetted clean and packed with gauze. The gall-bladder was sewed to the anterior abdominal wall, but not opened. A wick was inserted under it to drain the space rooted up by the freeing of the duodenum.

Convalescence from this operation was complicated by pneumonia in the right base, with much foul, purulent sputum. The temperature rose to 103° F., but fell to normal six days after operation, from which time convalescence has been uninterrupted. On May 20, the patient was discharged with a very small sinus in the wound. Owing to freedom from pain, the gall-bladder has never been opened. No sugar or abnormal urine constituents could be found after the second operation. Patient has gained ten pounds in weight.

A REVIEW OF THREE HUNDRED AND THREE OPERATIONS UPON THE STOMACH AND FIRST PORTION OF THE DUODENUM.[1]

WITH TABULATED REPORT OF THREE HUNDRED AND THIRTEEN OPERATED CASES.

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FUNCTIONALLY the small bowel begins at the entrance of the common duct of the liver and pancreas, which about marks the primitive division between the foregut and the midgut (Huntington). The first portion of the duodenum may be said to be the vestibule of the intestinal tract, and its diseases partake more of the character of those of the stomach rather than the intestine. In the large majority of instances, lesions at this point cannot be diagnosticated accurately from similar diseases in the stomach, and are usually due to the same causes. For this reason I have associated all of the cases of this description into a single group for the purpose of study. Total number of cases, 303. Of these 286 are taken from the records of St. Mary's Hospital, Rochester, Minnesota, and the remainder are from the records of the Minnesota State Hospital for the Insane at Rochester and St. Peter. The average age was forty-two; males, 42 per cent.; females, 58 per cent.

Duodenum, twenty-six cases, two deaths, 7.6 per cent. Lesions of the first portion of the duodenum can be divided into two groups; first, those due to ulcer, and, second, those associated with gall-bladder disease.

Ulcer limited to the duodenum was found eleven times,—one acute perforating, two chronic perforating protected by adhesions, five active, and three cicatricial contraction with obstructive symptoms. Two died after operation,—one from pneumonia following excision of the ulcer, one from exhaustion

[1] Read before the Philadelphia Academy of Surgery, May 11, 1903.

after gastro-enterostomy. In three cases, the signs and symptoms were not to be distinguished from gall-stone disease, and the operation was undertaken under the supposition that the trouble was in the gall-bladder. Five times ulcers existed upon both the duodenum and stomach. Of the sixteen cases in this group, fourteen were in males. The duodenum was frequently associated with gall-stone disease, and usually secondary to it; but in eleven cases the duodenum was the prominent feature. Five were due to gall-stone perforation, requiring intestinal suture. In three of these the gall-bladder was completely separated functionally from the bile-tract, and had become an appendage to the duodenum. Four times, crippling adhesions to the gall-bladder, but without stones or evidence of cholecystitis, were encountered, requiring dissection to loosen,—a periduodenitis of unknown origin. In one case an inflammation of an accessory lobe of the pancreas was the cause of dense adhesions. All but one of the cases in which the gall-bladder was involved occurred in females. There were no deaths in this group. In no instance was the duodenum the seat of primary malignant disease, and in but two cases was there any evidence of extension from pyloric cancer, and then it was not marked. In two patients the diagnosis of lesions originating in the duodenum was made previous to operation. The differentiating features of these cases were, good appetite, delayed pain, general absence of vomiting, and in only one case, and that on one occasion, was there hæmatemesis. In two cases there was evidence of blood in the stool. Otherwise the signs and symptoms were similar to lesions of the stomach or gall-bladder, and, even in the light of operative investigation, points of differentiation did not become evident. Our experience leads us to believe that surgical diseases of the duodenum are much more frequent than has been thought.

The subject of perforating and bleeding ulcers of the stomach has been so thoroughly dealt with by Keen and Foot, Weir, Robson, Rodman, and Andrews, and lesions of a similar character in the duodenum by Weir and Murphy, that it seems unnecessary to dwell upon the few cases which have occurred

in this series, and for further information, the classified table appended may be examined at leisure. In the present communication I will discuss briefly the results obtained and some practical deductions based upon two large classes of cases. First, Gastric ulcer and associated causes of serious disturbance. Second, Cancer of the stomach.

Stomach, 277 cases, twenty-eight deaths, 10.1 per cent. In the benign group there are 168 operated cases with eleven deaths (6.5 per cent.), and nearly all of these operations were for chronic ulcer and its late cicatricial results. Included in this class are all of the non-malignant obstructions. The conditions calling for operation were gastric pain with or without acute exacerbations, repeated hæmorrhages, emaciation from inability to retain sufficient nourishment. In a few cases, dilatation due to known or unknown cause gave mechanical reasons for interference.

Without going into the controversy as to the causation of gastric ulcer, there is no doubt that perverted stomach secretion is the most important manifestation in the majority of cases. This is shown by the almost constant association of excessive secretion in ulcer, and the fact that similar ulcers in the duodenum are in that part of the intestine not protected by the alkaline juices poured in through the common duct. In this connection, most interesting information is furnished by those reported cases in which a typical peptic ulcer has developed in the jejunum immediately below a gastrojejunostomy made for the purpose of drainage, the lesion in the jejunum in every particular resembling the original ulcer for which the gastroenterostomy was performed. In operating upon cases of this description, the excessive amount of gastric secretion is constantly in evidence, and the results of drainage operations in relieving the distress and healing the ulcer bear out the importance of this view of the case.

Attempts to classify ulcers of the stomach have been based largely upon post-mortem experience and accidental complications, such as perforation and hæmorrhage. Such classifications tend to exaggerate the importance of fatal complications,

which render surgery a desperate resource rather than a well planned effort at cure.

Further surgical observations are necessary to clarify the confusion which surrounds gastric ulcer. In attempting to group our operated cases, we found that there were such wide variations in the conditions present that no orderly classification could be made on a purely clinical basis. In a general way, the following answered the purpose most satisfactorily:

1. Round and fissure ulcers; (*a*) acute, (*b*) chronic. They have the distinguishing feature that there is but little thickening about the base of the ulcer. Many amount to little more than a fissure, and are closely associated with group 2.

2. Mucous erosions; a condition which must be accepted with caution.

3. Chronic ulcer with a thickened base and usually irregular in form, probably an extensive variety of the chronic round ulcer.

4. Benign obstructions without regard to cause, although usually of inflammatory origin.

In our experience at the operating table, it is the last two varieties which are most frequently met with. The acute round ulcer of Cruveilhier occurs by preference in the chlorotic type of adolescent females and usually responds to medical treatment. Operation is most often called for in the acute cases by that peculiar perforation so graphically portrayed by Rokitansky, "cut out by a punch;" or by severe hæmorrhage from the stomach. Chronic round ulcer and fissure ulcer do not often lead to harmful cicatricial contraction on account of their small size. Near the pylorus they may be the starting-point for a band-like stenosis encircling the pyloric ring. Chronic round ulcer is usually found in adults, and in our experience has been more frequent in females. It would seem that there is little difference between the chronic round ulcer and the chronic cicatricial ulcer, excepting that as the outer coats are involved the extent of ulceration increases and loses its characteristic round or oval form, while usually a healing process is apparent in some part of its extent. A subvariety of

this group is the "pore-like" ulcer described by Murchison, which is met with more often in adults and gives rise to grave hæmorrhages, and yet is so minute that it is difficult to locate, even at post-mortem. The mucous "erosion," limited to a small area or several such patches, was seen in a few instances. The large "mucous erosion" described by Dieulafoy as giving rise to alarming hæmorrhages was not met with. I am unable to say just how much importance is to be attached to the surface erosion of limited extent. In the first place, the detection is difficult. The whole question of the surgical exploration for round ulcers and erosions is one surrounded with difficulty and uncertainty. There are usually no external manifestations which lead to location of the lesion, and the only way a diagnosis can be established is to open the stomach and with a short, wide speculum explore the interior. The margin of the instrument may and frequently does produce a traumatism to the superficial mucous layers, and the result is very like the pathological erosion. We have seen undoubted and typical examples covered with a membranous film of mucous character which, when brushed off, allows the nature of the trouble to become apparent. The chief obstacle to accurate diagnosis lies in the surgical indications which are to be met. Round ulcers and erosions are often multiple, and, as a rule, do not cause cicatricial contraction at the pylorus. Clinical experience has demonstrated that drainage is the best method of surgical treatment with which we are acquainted, therefore an exploration, however attractive to the surgeon, is often not completed; but the surgical indications are fulfilled by some form of gastro-intestinal operation and the diagnosis remains unproved. The surgeon hesitates to expose the patient to even a slight risk for purely diagnostic purpose. The old adage, "a good prognosis is better than a good diagnosis," leads to operations based upon symptoms. If round ulcer is found, excision is the proper course; but there is always the chance that the ulcer excised is not the only one, and that others may exist undetected or in an inaccessible situation.

We may well ask ourselves in such cases, Does an ulcer

exist? and usually we may answer yes, and base the diagnosis upon such symptoms as would establish a medical diagnosis. Clinically, these cases come to us after medical treatment has failed utterly, and either the diagnosis is unquestioned or there is secondary interference with motility, resulting in retardation or retention and gastric dilatation, giving mechanical reasons for interference. The theory of pyloric spasm is most interesting, and is a hypothesis rather than a definite condition. I have examined the pylorus in over 300 cases at the operating table with a view of establishing a normal under anæsthesia. Usually, the normal pylorus in the anæsthetized patient will allow the thumb and the forefinger to nicely meet, about the caliber of a silver dime, and under some conditions of deep anæsthesia it may be found dilated to the diameter of a silver twenty-five-cent piece. I am satisfied, however, that spasm of the whole or some part of the pyloric portion of the stomach may and often does take place, and that it is one of the causes of the retention of the excessive secretions and distress; but I am by no means sure that it is confined to the pyloric sphincter.

The so-called "chronic ulcer" of Robson has a thickened base and is frequently of large size and irregular outline, in this respect differing from the chronic round and fissure ulcer, in which there is but little new tissue deposit about the ulcer. Does the round ulcer lead to the chronic cicatricial ulcer? It is probable that the difference is merely one of degree, although the fact that the latter is much more common in males is rather against this theory.

The majority of operations were for thick-based chronic ulcer of the stomach or its late results, and these cases were very satisfactory, the irregular thickened patch of stomach or duodenal wall often locating the process with exactitude. As a rule, the ulcer was located near the lesser curvature and not infrequently at the pylorus. The posterior wall was affected more often than the anterior, if only one surface was involved. On the duodenum the anterior wall was most often the seat of ulceration. The youngest patient was a girl of seventeen and the oldest a man of sixty-four. In 60 per cent. of our malig-

nant cases, a previous history of ulcer was obtained. In two cases, malignant degeneration of the margin of a chronic gastric ulcer was demonstrated; certainly a strong argument for the excision of such ulcers when possible. We found conditions favorable for excision of ulcer in only three cases. On six occasions we either excised or turned an ulcer in by suture, in combination with pyloroplasty or gastroduodenostomy. In two of these cases, three-fourths of the pylorus was excised and closed by suture.

Lund has pointed out that "sentinel" enlarged lymph nodes in either the lesser or greater omenta may aid the surgeon in locating the ulcer. We have found this a valuable observation.

In all of the ulcers of every description which we examined, the upper two inches of the duodenum, pylorus, pyloric antrum, and that part of the stomach lying to the right of a line drawn downward from the œsophagus was the seat of disease, and in only a few instances of extensive hour-glass contraction did the ulcer extend to the left of this line. In handling the stomach during operation, limited contraction of the wall could often be noticed in the pyloric third, but not towards the cardiac end. Cannon's experiments are very interesting in this respect. He demonstrated with bismuth and the X-ray that the fundus of the stomach did not contract strongly, but that the pyloric portion, by a backward action, kept up a current in the fundus. Ulcers occur in all parts of the stomach; but in the cardiac end it is a question if they are often the cause of chronic symptoms calling for operation.

Twelve chronic dilatations without ulcer or obstruction were operated upon. In all of the cases, the stomach wall was of normal or increased thickness, indicating that an obstruction, either from a high-lying but non-stenosed pylorus, or beyond the pylorus, existed. In 1895 I reported several cases of interference with free gastric drainage by "valve formation," due to a short gastrohepatic omentum holding the pylorus high, the body of the stomach sagging sharply downward. More than half were of this description. In a few instances the medical

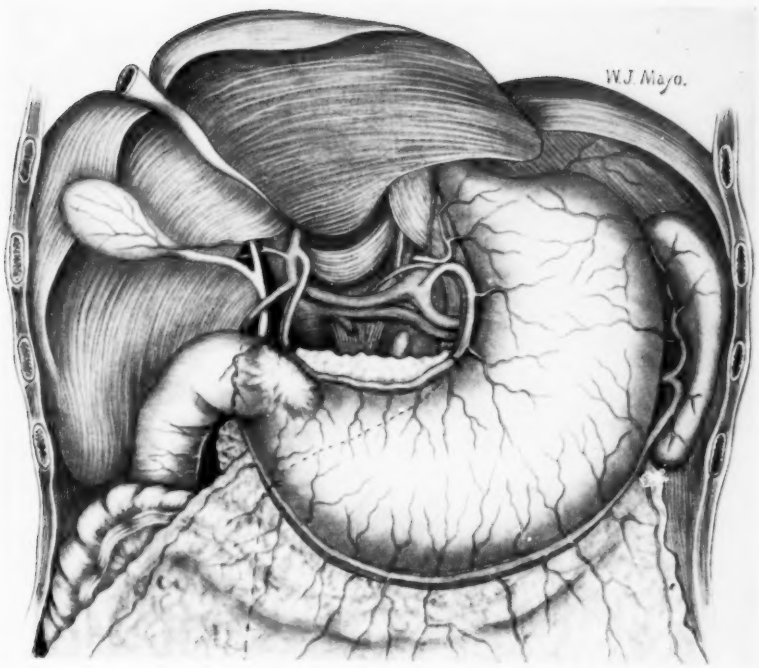

FIG. 1.—Showing line for incision in cases of ulcer of the stomach.

diagnosis was extreme atonic dilatation; but even in these cases there was no great thinning of the gastric wall. We have not considered simple gastroptosis sufficient cause for operation, but in a few cases exploration revealed this condition, and in all the stomach wall was either of normal thickness or thinner than normal. In three of these cases, shortening of the gastrohepatic ligament after the method of Beyea was done.

Cancer of the stomach, 109 cases, seventeen deaths, 15.6 per cent. Late diagnosis and cachexia make the aspect of this group discouraging. Palliative operations predominate with considerable immediate mortality and no great prolongation of life. The hope of the future lies in early exploratory incision, and the necessity for this depends upon clinical observation rather than laboratory methods, which too often only become valuable when the extent of the disease is beyond cure. Given a patient of middle or later life who begins to lose flesh and appetite and suffer from indigestion without apparent cause, the possibility of cancer should be considered; and if the source of the symptoms cannot be shown within a few weeks, the situation should be explained to the patient, and the choice between exploration and procrastination allowed him. When we consider that early operation is the only hope, we may not wait on our own responsibility. The public in this way will soon become educated and cures will be more frequent. Gastrojejunostomy for malignant disease, in our hands, has had an increasing mortality, due to the fact that the better cases are selected for gastrectomy, and the late hopeless obstructions are given the meagre benefits of gastro-enterostomy, thirty-four cases, ten deaths, 30 per cent.

Is there an outlook for cancer of the stomach? We know of the prime necessity for early operation; it now remains to demonstrate how the procedure can be made more effective. In a general way, the lymphatics of the stomach lie in three groups; first, the lesser curvature and lesser omentum; second, along the greater curvature and the gastrocolic omentum; third, in the gastrosplenic omentum. The main lymphatic channels follow the direction of the blood-vessels to the deep glands about the cœliac axis. The dome of the stomach, as

pointed out by Robson, has no main lymphatic channels and few lymphatic glands. If all of the stomach excepting this portion be excised, the remaining part will be adequately nourished on the right side by cardiac branches derived from the gastric artery which joins the stomach at a point from one to one and one-half inches below the œsophagus. On the left, the vasa brevia given off from the splenic artery distal to the origin of left gastro-epiploic vessel, a distance of four and one-half to eight inches from the œsophagus, give an adequate blood-supply. These vessels anastomose with the inferior phrenic vessels. Therefore, excision of all the stomach lying below and to the right of a line drawn between the gastric artery and the left gastro-epiploic vessel is the logical operation. The advantage of this line of section is obvious. All of the main lymphatic connections are removed at the primary operation. The remaining portion of the stomach we know clinically is seldom involved unless the primary lesion is at the cardiac orifice, and the retention of the dome of the stomach enables comparatively easy intestinal anastomosis. One reason that only from 5 to 8 per cent. of gastric cancers have been cured by extirpation lies in the fact that a part of the organ has been retained in which the vascular and lymphatic connections with the diseased area have not only been close but direct. In the dome of the stomach, the lymph current is feeble through small vessels, and, most important of all, is in the other direction. Mikulicz has already called attention to the necessity of removing the whole of the lesser curvature with its gastrohepatic omentum, and has done much to elucidate the question of lymphatic infection by showing that in twenty cases of gastric cancer only one was completely free from lymphatic involvement, although, in a total of 189 glands examined, 110 were found to be without contamination. In making this radical operation we have proceeded as follows:

First, ligate the gastrohepatic omentum from the pylorus to the gastric artery, which is tied. The section is made as close to the liver as possible, and includes nearly the whole of the lesser omentum. This mobilizes the pyloric end of the stomach, which is drawn down and out. Second, with the

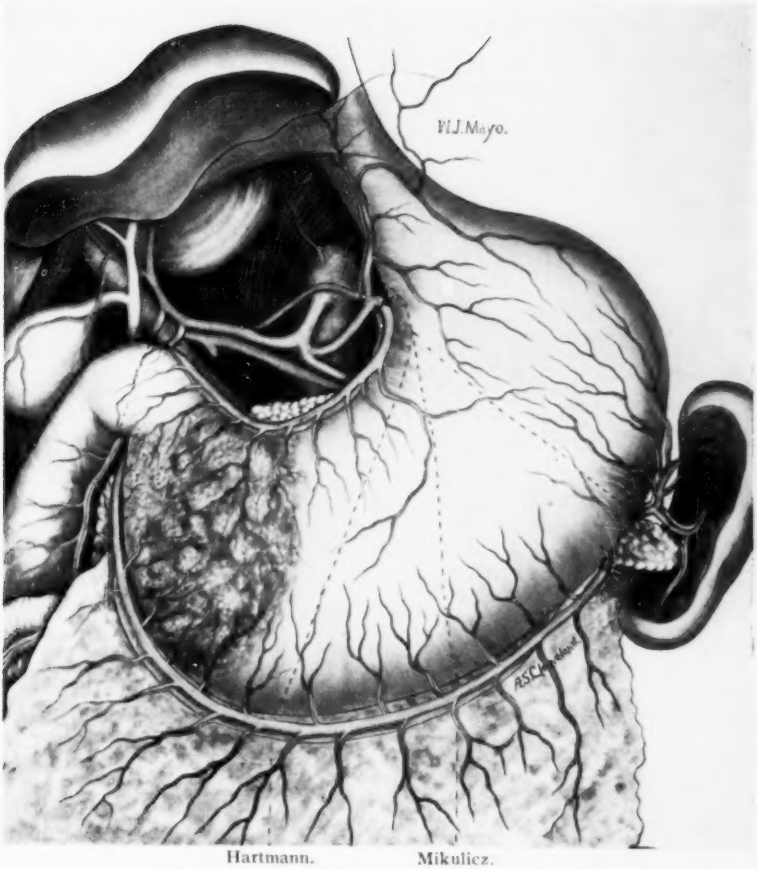

FIG. 2.—Lines of incision practised by different surgeons in the removal of cancer of the stomach.

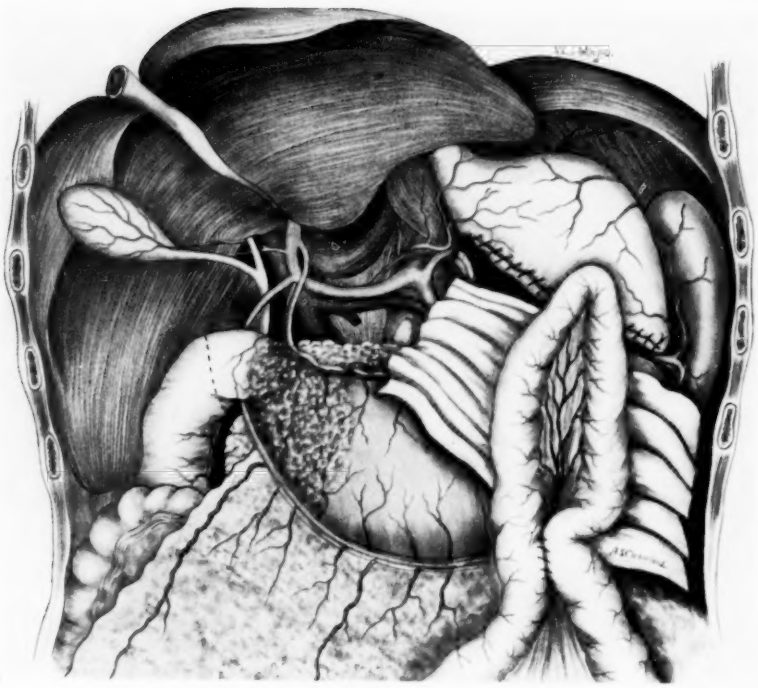

FIG. 3.—The completed operation for cancer of the stomach.

fingers in the lesser cavity of the peritoneum, the gastrocolic omentum is ligated at a safe distance. The duodenum, on the one side, and the pylorus, on the other, are doubly clamped and divided between with the cautery knife. A purse-string suture of silk is placed around the duodenum three-fourths of an inch below the divided end, and, after suturing with catgut through the cauterized area, the stump is inverted and the purse-string suture drawn tight. This disposed of the duodenum permanently. Third, ligation of the gastrocolic omentum to a point near the origin of the left gastro-epiploic artery, which is tied. Fourth, a groove is made by heavy pressure forceps, separating the dome from the balance of the stomach and with catgut on two needles, a shoemaker stitch in the pressure furrow renders section with the actual cautery bloodless and avoids opening the portion of the stomach to be retained. This line of suture is turned in by a continuous silk Cushing suture supported occasionally by an independent Halsted stitch of the same material. In this step of the operation we sometimes use the Kocher clamp and suture each layer separately. Fifth, gastrojejunostomy between the gastric pouch, which is just about large enough for the purpose, and the jejunum. Sixth, entero-anastomosis between the two limbs of jejunum, short circuiting the biliary and pancreatic secretions as nearly as possible at the same level as the origin of the jejunum. It took two deaths to teach us the value of this manœuvre. The deaths were not from regurgitant vomiting; but when the anastomosis was affected in some cases, the intestine was sharply bent at the site of union, being drawn upward and to the left in such a manner as to leave from fourteen to sixteen inches of jejunum hanging upon the anastomosed area, a situation in which peristalsis does not materially aid in onward flow of the biliary and pancreatic secretions. The proximal loop becomes distended with these juices to the level of the anastomosis, giving a traction weight of a column of fluid the diameter of the distended intestine. In one patient on the fifth and in one on the ninth day union suddenly gave way entirely, or in part, in patients apparently doing well. This does not happen in every case,—two out of

eight only; but in at least half of the cases the bad mechanics of the situation was evident on inspection. Seventh, the remains of the gastrocolic omentum are attached to the posterior wall and the abdomen closed. This operation should give all the benefits of complete gastrectomy in pyloric cancer. (I find that Mr. Moynihan, of Leeds, has recommended and practised a similar procedure, but his work was buried in the Clinical Society of London, which does not permit of journal publication. I did not know of it until he informed me personally during his visit in May, 1903.)

In view of the splendid work of Hartman and Cuneo, it is a question whether the operation outlined should be the routine one, or for exceptional cases only. That the whole of the lesser curvature with the glands in the corresponding portion of the lesser omentum should be removed is the conclusion of all of large experience; but the advantage of removing the major part of the greater curvature is open to debate. Cuneo demonstrated that the lymph current along the greater curvature was from the left to the right, and that in pyloric cancer not only is there comparatively little tendency to lymphatic involvement in this region, but that it is confined to the glands in the immediate vicinity of the growth, and does not extend to the left of the pyloric portion. Hartman therefore bases his line of section upon this fact, and removes all of the lesser curvature and saves as much as possible of the greater curvature. We have several times made an operation very similar to that described by Hartman, as it is certainly much easier than the one which we have outlined, and, as the mechanics of the anastomosis is better, entero-anastomosis is unnecessary. Occasionally, however, growths or glands are found to the left along the greater curvature. It may be said that such cases are inoperable, yet we have had two such patients live beyond a year. In the eight cases operated upon by the radical method given above, there were three deaths, while there were but two deaths in the eighteen remaining cases operated by various methods from simple pylorectomy to the operation of Hartman. The former group comprises only a small number of the worst cases,

and some of the deaths were avoidable by a better technique. Be this as it may, some form of radical extirpation has been the only reasonably satisfactory operation we have performed for cancer of the stomach, twenty-seven cases, five deaths, 18.5 per cent. (Since completing this paper, one case died after five weeks from abscess of the lung, making six deaths, 22.5 per cent.) One patient lived three years and seven months before recurrence. Several are alive and well over two years, and the general average has been over a year. It is surprising how few of those recovering from the operation have failed to live a year or more.

It may not be out of place to briefly discuss the merits of the three chief methods of improving stomach drainage, namely, pyloroplasty, gastro-enterostomy, and gastroduodenostomy.

Nineteen cases were subjected to the pyloroplasty of Heinicke-Mikulicz; six of these came to secondary gastrojejunostomy through failure of the operation to adequately drain the stomach. The remaining cases are well. There were no deaths. The opening can be made of sufficient size, but the increase in caliber is not in the line of gravity drainage, or, at least, the enlargement of the opening is as much above the pylorus as below it, and the greatly dilated stomach with its overstretched and degenerated musculature is unable to elevate the food, and the stagnation is not entirely relieved. Again, in the six reoperated cases, the pylorus was found adherent at a high level, due to the abstinence of food and other causes of downward traction during the healing process. In three cases we fastened the pylorus, after plastic operation, to the neighborhood of the umbilicus by suture, to secure a low point. These patients have remained well; but as we were also careful to choose only moderate dilatations, the value of the manœuvre is uncertain, and there are objections to the plan.

Gastro-enterostomy was done 168 times, divided as follows: Gastrojejunostomy, 121; gastroduodenostomy after Finney, twenty-six; independent gastrojejunostomies in connection with pylorectomy and gastrectomy, twenty-two. Of

the 121 cases of gastrojejunostomy made purely for drainage purposes, there were seventeen deaths. The percentage of mortality in the benign cases was 8 per cent., in the malignant, 30 per cent.; the great mortality of the latter being due to the choice of favorable cases for radical operation, the hopelessly advanced and cachectic coming to gastro-enterostomy, and, could the condition have been known beforehand, an operation would not have been undertaken in some of these cases.

Gastrojejunostomy for benign obstruction at the pylorus is one of the most satisfactory operations with which we are acquainted. It rapidly drains from the lowest point, and if the obstruction at the pylorus is permanent, the new opening does not contract materially. Again, if the opening be made at the bottom of the stomach-pouch at or near the greater curvature, regurgitant vomiting will not take place and entero-anastomosis is unnecessary, providing either the Murphy button or Robson bone bobbin be used to mechanically maintain an opening during the early critical period. We can only speak from these two methods, as we have had no experience with any other plans. In some instances a feeling of distention or vomiting after operation may take place, and, under such circumstances, we promptly direct gentle stomach lavage. We now use the posterior suture operation over the bone bobbin for benign obstructions and the Murphy button for malignant disease, and in the latter instance the anterior method. However, as between the suture and the Murphy button and the anterior and posterior operation we have been unable to see any marked difference in results beyond the occasional retention of the button in the stomach, which seems to be of no practical importance.

During the recent visit of Professor Mikulicz to this country (May, 1903), he had the kindness to do a posterior gastro-enterostomy in our clinic by a method which I believe is greatly superior to the one we had been in the habit of doing. It avoids the possibility of angulation, as it does not form a loop with its attendant dangers. The operation as performed depends on two simple principles. First, the origin of the jejunum lies above the greater curvature of the stomach.

After opening the transverse mesocolon and fastening it to the posterior wall of the stomach, the upper three or four inches of the jejunum lie directly in contact with the gastric wall, hanging perpendicularly with its free border (opposite the mesentery) facing the stomach wall. Second, by making a transverse incision in the jejunum three or four inches from its origin and an incision close to the greater curvature of the stomach, a suture anastomosis is made in which the stomach is drained at the lowest point without the possibility of kinking the intestine. The whole trouble has been that in making a longitudinal incision in the intestine it was necessary to form the misfortune-breeding loop. The scheme of the operation is much the same as used by Czerny. The good mechanics of the procedure has been especially dwelt upon by Peterson of the Heidelberg Clinic.

Gastrojejunostomy, if the pylorus be unobstructed, is far from satisfactory. In a paper read before the American Surgical Association, June, 1902, I reported four cases in which contraction at the site of the anastomosis took place, and we have reoperated upon four similar cases since that time. In six of these cases we did a secondary entero-anastomosis between the limbs of the loop. Four times the entero-anastomosis was effected with the Murphy button, and two of these patients died from sudden separation of the anastomosed area at the end of the first week. This did not take place in two suture operations. In all of these cases the proximal limb of jejunum from the point of anastomosis to its origin looked enlarged and thickened, a condition that might be called water-logged and in marked contrast to the bowel immediately distal to the anastomosis. In this condition of the afferent loop lay the reason for the failure of the plastic union after the button, and merely illustrates the well-known danger of setting up pressure necrosis in damaged tissues. Primary entero-anastomosis with the button is safe, but not so secondary operations. If the obstruction at the pylorus is complete, this condition of the jejunum above the gastro-intestinal anastomosis has not been found. A large number of cases of benign affections of

the stomach without pyloric stenosis require operation. This is particularly true in ulcer, and relapse after this operation has been frequent. Our observations would seem to show the following course of events. After the operation there is at least temporary healing of the ulcer. The pylorus begins to functionate normally and the unnecessary gastro-intestinal fistula contracts. There is renewed irritation from retained secretions, followed by reopening of the ulcer, return of pyloric spasm, and failure of the operation to effect a permanent cure. In some cases the double stomach drainage seems to give rise to unpleasant symptoms without contraction of the fistula. In twenty-eight cases of gastrojejunostomy with open pylorus, eight came to secondary operation from contraction of the gastro-intestinal opening, while in all cases with permanent obstruction at the pylorus there were no cases of secondary operation from this cause. This has also been the experience of Ochsner, who also points out the fact that if relapse takes place, symptoms will arise within four months. To obviate this sequela, in one case, at the primary operation, we divided the pylorus and closed both the gastric and duodenal ends by suture, thus creating the favorable condition of complete obstruction. Once we sutured the pylorus high up under the liver, causing valve formation, as first suggested by Cordier. Once we placed a circular purse-string suture about the pylorus, closing sufficiently tight to obstruct the opening. This idea was adopted from Dawbarn. I may say that all of the methods proved satisfactory; but there was the grave objection of too much operating for a benign condition, and it introduced unnecessary elements of danger. In June, 1902, Dr. Finney introduced his method of so-called pyloroplasty, but which is in reality a gastroduodenostomy. The opening is downward in the line of gravity, and in most of the suitable cases for this operation the gastric dilatation is not extreme. In two cases of rather extensive dilatation and pouching we combined with it shortening of the gastrohepatic ligament as described by Beyea. The operation of Finney is especially adapted to those cases in which there is little disease about the

pylorus. It enables careful examination of the pyloric end of the stomach, and excision of a neighboring ulcer can be easily combined with it. We had two such cases. It is less suitable if there be extensive involvement of the pylorus; but it is in just this class of cases that gastrojejunostomy is at its best. The question to be settled by further experience is, whether the operation of Finney will as rapidly cure active ulcer of the stomach as gastrojejunostomy. In the latter operation the drainage is from the cardiac end to the left of the muscular pyloric portion; while, even if the pylorus be made of ample size by the Finney procedure, the food and secretions must pass the ulcer site before it leaves the stomach, and we know that obstruction is not all necessary to the formation of ulcer, as they exist beyond the pylorus in the duodenum. In twenty-six cases operated upon by the method of Finney, we had one death, and that from avoidable cause. Were it not for the mortality, resection of the muscular pyloric portion of the stomach would be indicated in gastric ulcer, as in this way the ulcer-bearing area would be permanently disposed of and an absolute cure insured. This was first suggested by Rodman, and I believe with him that this will be the operation of the near future.

A TABLE OF 313 OPERATIONS UPON THE STOMACH AND FIRST PORTION OF THE DUODENUM.

	Stomach.		
Benign.	Total.	Recovered.	Died.
Gastrojejunostomy	89	82	7
Gastroduodenostomy	28	27	1
Pyloroplasty	19	19	..
Gastrostomy	4	4	..
Gastrotomy	5	5	..
Excision of ulcer	3	3	..
Perforating ulcer	2	1	1
Gunshot	1	1	..
Gastrorrhaphy	1	1	..
Gastroplication	1	1	..
Hour-glass stomach	3	2	1
Adhesions	8	8	..
Shortening of gastrohepatic ligament (Beyea)	6	..	..
Subdiaphragmatic abscess from gastric ulcer	2	1	1
Fistula of stomach and gall-bladder	1	1	..
	173	156	11

Cancer.

	Total.	Recovered.	Died.
Gastrectomy and pylorectomy	27	22	6
Gastro-enterostomy	34	24	10
Gastrostomy	13	11	2
Exploratory	38	38	..
	112	95	18

First Portion of Duodenum.

	Total.	Recovered.	Died.
Excision of ulcer	3	2	1
Perforating, acute	1	1	..
Perforating, chronic	2	2	..
Chronic ulcer	6	5	1
Ulcer of both duodenum and stomach	5	5	..
Anastomosis between the first and second portion of duodenum for ulcer	1	1	..
Adhesions, result of periduodenitis	4	4	..
Adhesions, result of inflammation of accessory lobe of pancreas	1	1	..
Fistula between gall-bladder and duodenum requiring suture	5	5	..
	28	26	2

AN IMPROVED FILIGREE FOR THE REPAIR OF LARGE DEFECTS IN THE ABDOMINAL WALL.[1]

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THE problem which confronts the surgeon in the removal of a large tumor involving the abdominal wall is not how to get it out, but what to do afterwards towards a repair of the damage. If a large section has been cut away, and the operator would completely restore the integrity of the barriers to herniation of abdominal viscera, then he must devise for his patient something which will give greater security than that afforded by the various autoplastic measures of the past. The need of an artificial aid for reinforcing the belly wall has been felt, too, in those cases where an extensive hernia has resulted from the stretching of a scar or from the thinning which is produced when an improperly directed incision disturbs nerve supply and causes muscles to atrophy. Further, the incorporation of foreign substances into the tissues has not been despised even in the treatment of ordinary inguinal and femoral hernia, though it is not my purpose in this article to deal extensively with these two last-named conditions. A large umbilical hernia is, on the other hand, a very different matter, and has surely been regarded as a sort of *bête noir* of surgery by many.

A serious consideration of prophylactic and remedial measures in large herniæ, of whatever nature, is surely justified by the knowledge that the individual thus afflicted can be nothing but a miserable invalid. Not even the best fitting supporter can render life more than bearable, nor is it possible for such a person to make any severe exertion, whether it be in the pursuance of an occupation or in the enjoyment of an athletic sport. None

[1] Read before the Missouri State Medical Association, April 22, 1903.

of the autoplastic operations offers a guarantee of success in the treatment of these cases, provided the lesion be extensive, and unfortunately all tend to become so as time passes. It was not until the introduction of the silver-wire filigree that any procedure intended for the betterment of such cases was attended with anything like uniform good results. A step was taken in the right direction when the late lamented Schede commenced to suture simple abdominal wounds with silver wire, but this valuable procedure is of course of no avail in those instances where the lips of a defect cannot be approximated, no matter how great the tension applied, as has been the case in several operations which I shall detail later. It was in the effort to remedy this state of affairs that Witzel constructed in the tissues, during the operation, his first rude net-work of cross-wires, and in so doing suggested to the surgical world the idea of embedding a ready-made filigree. He drew the edges of the wound as near together as possible with ordinary heavy silver sutures which penetrated muscles and fasciæ; then, after these had been tied, ran slender wires in every direction across the opening which remained, hoping in this manner to sufficiently reinforce the scar tissue which should form between and around them.

A quicker procedure, and one which is valuable where the wound edges can be almost or entirely approximated, is that of Phelps, who has treated many inguinal herniæ by placing coiled silver wire on the floor of the canal, and then suturing the other layers of the abdominal wall over it. This alone would not, however, be sufficient for the closure of a large gap, because the small wire coils, lying side by side, could not possibly offer that strong support which can be gained only by anchoring in healthy tissues, wires which shall run like the trusses of a suspension bridge, straight across the weaker portion of the field. Goepel, who was the first to make use of the ready-made filigree, evidently appreciated this principle, for he, by implanting one four by six inches in size upon the muscular layers, was enabled to supply an exceedingly large segment of the abdominal wall. Another of the very few surgical writers

who have given us any account of the results attained in this way is Meyer, who reports three cases successfully treated with a netting made up in just the same way that ordinary mosquito bar is constructed. There were certain disturbances in the after-course of one of his cases, but in the end he attained satisfactory results in all three. The disturbances to which I have just referred led to a secondary operation in one instance, and can in my mind be explained by the stiffness of the filigree used, this stiffness being the very objection which I have striven to eliminate in the construction of the little contrivance proposed herein.

All of the above-named authors secured essentially the same results by following the same general line of treatment, but there was considerable difference of detail in the work of each, which becomes a matter of greater import as we go deeper into the subject. Let us then review the technique of the various operators, in order to be able to construct a netting which shall possess none of the features that have proven objectionable in the hands of others, one which shall offer the patient the greatest security together with the minimum possibility of discomfort or danger. One can readily imagine the difficulty of Witzel's procedure of manufacturing a filigree in the tissues while an operation is in progress; but he cannot know just how hard it is until he has tried it. I most heartily subscribe to the idea of putting in a ready-made filigree, for the further very good reason that the surgeon who has measured the wound before operation and manufactured the wire support beforehand can, as a matter of course, make for his patient a much more satisfactory as well as a better fitting one than any which can be devised while the individual is upon the table, amid the hurry and embarrassing surroundings of an extensive surgical procedure. It is equally important that the ready-made filigree can be anchored between the tissue layers at a much greater distance from the lips of the wound than is possible where the whole thing must be made with a needle while the wound is open; it being a matter of physical impossibility to perfectly elevate the tissues and to work between or beneath them at a

great distance from the free wound edge without more handling of the tissues and more laceration than is commensurate with satisfactory healing and repair. It is necessarily a slow procedure and likely, in consequence, to be attended with faulty asepsis, while much as a matter of course depends upon this last-named factor, especially since a foreign substance is being incorporated in the body tissues. Then the small silver coils of Phelps cannot be expected to support the scar barrier across a large new opening, useful as they are in their proper place. Those at the periphery would no doubt hold perfectly, while those at the centre, not being attached to them, would as a matter of course allow of separation from the others. The net used by Meyer has been referred to as possessing more stiffness than desirable, when the tissues in which it is to be embedded are extremely pliable, and should in my opinion be subjected to the presence of only such a filigree as will permit the exercise of this quality to the fullest extent. Dr. Meyer's net-work consisted of wires crossing at right angles and equidistant from one another, which method of weaving cannot fail to lend a more or less board-like consistence to the finished product. My results attained in the use of a less bulky contrivance will show that there is no necessity for such a number of wires running in two directions.

The form of filigree which I herewith introduce depends upon the knowledge that scars in the abdominal wall spread laterally but not longitudinally to any great extent, and my results in the cases to be described bear out the truth of this line of reasoning. After considerable observation, it seems to me illogical to strengthen the scar with a great number of needless wires which run parallel to the axis of the incision and which, beside being of no avail, can by their presence serve only to stiffen the abdominal wall, and thus prevent the perfect mobility which has been mentioned as essential to it, being, so to speak, a prerequisite of the patient's comfort.

My filigree depends, as you will see by the appended illustration (Fig. 1), for its efficacy upon the fact that all but one of its wires run across the long axis of the scar and penetrate

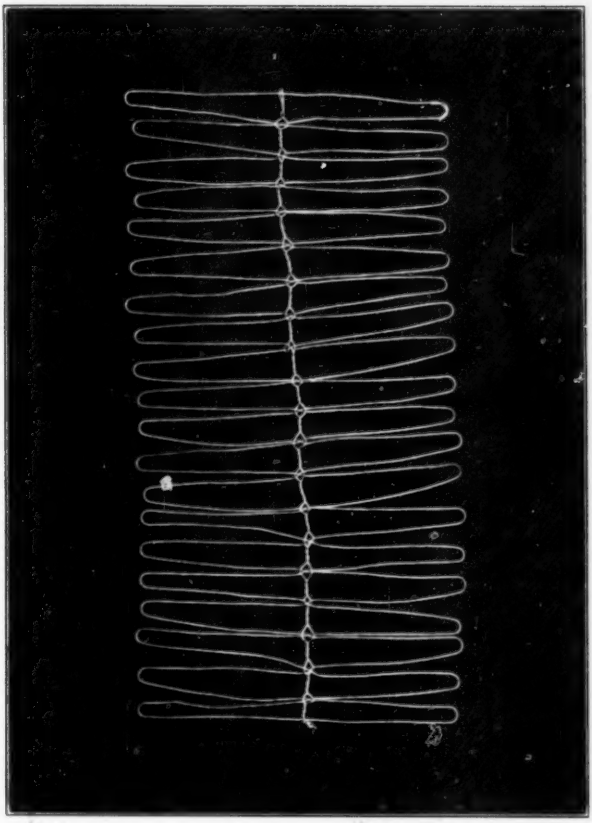

FIG. 1.—Represents the form of filigree which is proposed for general use.

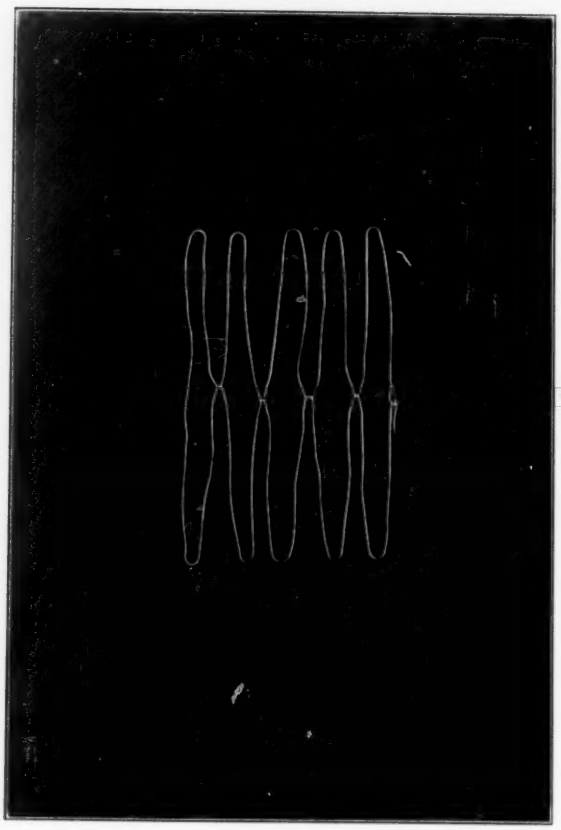

FIG. 2.—Represents a modification of No. 1 (without the median connecting wire). The cut shows only one-third of a net which should be the same size and shape as that in Fig. 1.

for a distance of one or two inches between the tissue layers, where they are firmly anchored, not by sutures, which I consider perfectly useless in this connection, but by newly formed scar tissue, which naturally fills out the opening of each loop while the patient is in bed after the operation. I purposely bend each of these cross-wires into the form of a loop in order that there shall be no sharp irritating ends anywhere; and, further, I lay great stress, in constructing my filigree, upon the fact that each of these loops be entirely separated at the free end from its neighbor; thus it is seen that the minimum of stiffening is imparted to the tissues by the single longitudinal twist which binds the several loops together in the median line of the contrivance. This last-named wire strand appears necessary to prevent the possibility of a hernia between two of the cross-wires, which might easily be forced slightly apart if they were not fastened together at all. One can hardly imagine the difference in pliability between such a filigree and one woven of wires crossing at right angles and equidistant from each other throughout the whole field. The latter, by its rigidity, can have only the effect of robbing the abdominal wall of much of its natural pliability.

In cases that allowed of no accurate determination beforehand as to the size of filigree desired, I have used a form of net which differs slightly in its construction from that described above. The illustration (Fig. 2) of a short one given herewith shows that this can be drawn out or shut up like an old-fashioned hat-rack. It is different from Fig. 1, inasmuch as no median wire twist binds the cross loops together; however, this has been compensated for in my work by sewing it in place with a continuous suture of fine wire, being careful to loop the suture around each point of crossing in the filigree.

Nothing is easier to make than one of these wire nettings; after trying several methods, I have found it simplest to drive wire nails through a board (their distance apart being regulated by the size of the filigree desired), after which the board is turned over and the points of the nails are used to string the loops upon, much as the lace-weavers use their pins. The one

shown in Fig. 1, with twenty loops on either side, is five by two and one-half inches in size, one which has been found convenient in postoperative herniæ. As to the distance between the cross-wires, I can only say that experience has not yet shown that it is to be improved upon. The shape of the contrivance, too, can be modified as the surgeon may see fit; for the inguinal region a triangle has been suggested, and this would surely suit the requirements of the region if one of its sides were fitted to Poupart's ligament. It has been my practice to make use of a gauge 27 silver wire, with which I have as yet no fault to find; I tried aluminum bronze once, but found it far too stiff for the purpose.

It seems that most of the surgeons who have used a filigree have sewn its edges firmly into the tissues, something which I believe to be entirely superfluous. I have never done anything of the kind; still, none of my seven have shown any disposition to pull out. It is surely sufficient to attach the longitudinal twist to its tissue bed by a few sutures, and thus prevent the filigree from slipping before the operation is finished; but any further attachment is merely a waste of time and a needless tissue laceration, since there can be no displacement after granulations have filled out the loops. Then, too, scar formation is certainly complete before the patient is let out of bed at the end of three weeks, as has been my practice. I have but to mention the well-known difficulty of removing gauze or a fenestrated drainage tube into which granulations have grown, to quiet any fears that may obtain as to a filigree moving while the reparative process is going on.

It is hardly possible, regarding the layers between which the filigree should be inserted, to formulate a rule which will cover every case. This is a matter which has depended, in my practice, largely upon the ease with which certain layers have come apart. It may, however, be stated as a general conclusion that it is logical to place the contrivance as deeply as possible, especially since it is used chiefly where the wound edges cannot be brought together, and dead spaces must be obliterated. Suppose an instance in which only peritoneum (with attached

fat and transversalis fascia possibly) and skin can be entirely brought together, then it must appeal to any one as being better that the filigree rest upon the floor of the defect rather than outside the muscles, for it is then easier by pressure or suture to prevent the formation of dead spaces between filigree and skin than those between filigree and peritoneum. In no case is the appliance to be placed upon the aponeurosis of the external oblique, since an exposure of that tissue, sufficient for the purpose, must result in a necrosis of it, on account of the cutting off of its blood supply which comes through its covering of fat.

It may seem like a radical stand to take, but experience teaches me that it makes absolutely no difference whether the muscles and fasciæ be or be not completely drawn together as long as a suitable wire filigree extending sufficiently far out between healthy layers be properly implanted and heal in. I have had the opportunity of observing that the anatomical and functional results are just as good where the newly formed segment of the wall is composed of peritoneum, wire, and skin, as is the case under any other circumstances which the most imaginative mind can conceive.

After observing how well my filigrees functionated in several patients, I became naturally curious to learn just how much tension the loops could withstand, after being anchored in no other way than by scar tissue formed in them; so I opened up the abdominal wall of a small dog, separating the intact peritoneum from the overlying structures in the median line, where I embedded a small filigree like Fig. 1. This small contrivance had only eight loops on each side, and projected out but three-fourths of an inch under the edge of the wound, not being sutured in position at all (to make the test the more severe). The recti were then sewn together with a continuous silver wire as was their anterior sheaths, the skin being united by interrupted sutures of silk. The animal was then turned loose without a dressing of any kind, and from the second day he ran around as such animals are accustomed to do under ordinary circumstances, furnishing in this way what can well be considered a crucial test for this method of wound closure.

At the expiration of four weeks, the wound having healed completely, I cut down at one side of the original incision, until the loops forming one edge of the filigree came into view; into four of these I fastened a hook, and then it was only after a tension measured by eleven pounds on a spring balance had been applied that I managed to loosen the hold which four loops on the opposite side had secured. It was then by no means possible to lift the filigree from its bed; the best that could be done in this line was to tear it to pieces, so firmly had nature anchored it. While such an experiment does of course not actually indicate the amount of resistance which such an appliance will manifest against the intra-abdominal pressure directed against its median portion and at right angles to the direction of its cross-wires, still, this is enough to demonstrate that forty such loops, forming both sides of the filigree which I have used on the human subject, will certainly manifest sufficient resistance for all practical purposes, when it requires a full eleven pounds to dislodge only four of them.

There is still another question of decided importance which comes up in this connection, upon which I regret to say we have no definite information, *i.e.*, the influence of such a device upon the abdominal wall of a growing child or upon that of a pregnant woman. Does it have the effect of retarding or of misdirecting the expansion of the part affected? Or do other segments compensate, by an unusual increase in their dimensions, for what is lacking in this new condition of affairs? However this may be, I cannot throw light upon this subject, as I had at one time hoped to do; for, as you will later learn, one of my patients, three and one-half years old, in whom I implanted such an appliance, died long before sufficient time had elapsed for her to furnish us with satisfactory data bearing upon this point.

Case I.—Ruby G., three and one-half years old, colored, fell some six weeks ago, striking the right side against a hall banister. At the site, between last rib and crest of ilium, there is now a rapidly growing soft mass the size of a lemon; no increased tem-

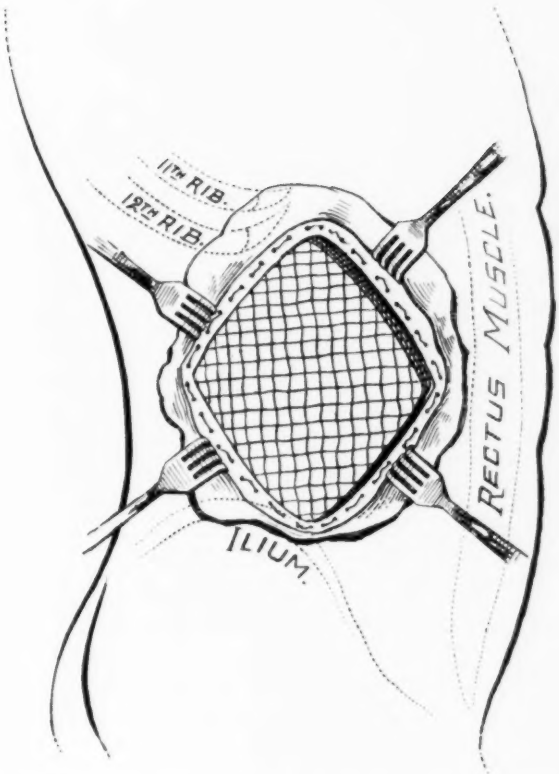

FIG. 3.—The form of filigree which was built up in the tissues during operation in Case I.

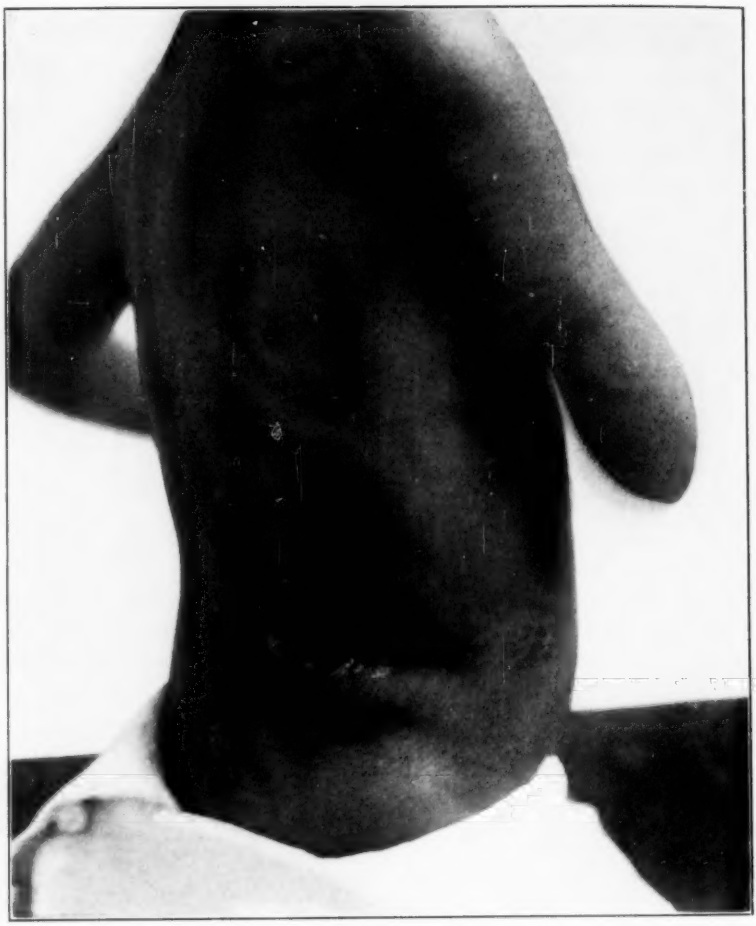

FIG. 4.—Photograph of patient No. 1 two months after operation.

perature, no fluctuation, and no change in the skin, which is free from the mass in the deeper layers of the abdominal wall. On April 5, 1901, I excised at the Provident Hospital what was found to be a small round-cell sarcoma, taking at the same time every tissue which was in any way connected with it. After retraction of extensive skin flaps, I removed a rectangular segment of the abdominal wall down to the subperitoneal fat, which was in no way connected with the tumor; this segment contained the twelfth costal cartilage in its upper angle, a portion of the crest of the ilium in its lower, while the anterior portion of the defect exposed the rectus abdominis; and the posterior, the vertebral column. It was manifestly impossible to close so vast a defect by any form of autoplasty, so I set about to construct in the tissues a filigree. This I did with gauge 25 silver wire, being careful to anchor every strand through and through all the tissues except the skin and peritoneum; just how this was done is perhaps better shown by Fig. 3 than any words of mine can describe. There was absolutely no bulging when the patient struggled in the effort at vomiting, so the skin was sewn over the net-work and the child put to bed. The wound healed by first intention, and in three weeks the little one was allowed to get up and run around. There was never at any time evidence that the patient realized the presence of the filigree, nor did the wall ever bulge at the site; in fact, there was never a manifestation of those undesirable consequences which must have followed such an operation had no such means of closing the abdomen been adopted. Fig. 4, made from a photograph taken two months after the operation, shows conclusively that the wire net did its work. This most interesting subject, from whom I had hoped much in the way of showing what effect a filigree has on the development of the abdominal wall, died, three and one-half months after the operation, of a recurrence *in situ*. The wires were found to be evenly scattered through the new masses of sarcoma tissue.

Case II.—Mr. S., middle-aged white man, on whom omentopexy (Talma's operation) had been performed six months before I treated him. His hepatic cirrhosis manifestations had improved in many respects; still, there was sufficient reaccumulation of the ascitic fluid to cause a small hernia; though I can say from personal observation that the former operation had been well done, and that the wound had healed by first intention. So much

discomfort was caused by this hernia that he applied to me for a second operation, and June 8, 1901, I implanted a filigree at the Rebekah Hospital. The sac was dissected out, the recti and their sheaths being freely exposed, but the peritoneum not opened. I placed upon the floor of the wound thus formed a filigree, two by four inches in size, of aluminum bronze wire gauge 30. This contrivance was not quite like those which I now use, being made up of cross-wires woven over a single wire frame; however, it was a step in what I have learned to consider the right direction, since it did not have a large number of wires running parallel to the incision, and thus adding stiffness to the net. As is stated in what has gone before, I have discarded any sort of permanent frame, preferring to have all the cross wires end in separate loops. I did not let out the excess of ascitic fluid; hence the muscles and their sheaths failed to meet over the filigree by almost an inch; their edges were separately made to approach within an inch of each other by the use of a running suture of silver wire; and when the skin was united over this, it is seen that a portion of the anterior abdominal wall consisted of nothing but peritoneum, wire filigree, and skin; that, too, in an individual whose abdomen was gradually filling with ascitic fluid. Could a more severe test of the method be imagined? What I have just said applies to the lower four-fifths of the wound, which is still intact after two years have elapsed. I cannot say as much for the upper fifth, the portion which my filigree did not quite cover; at the operation I covered the small defect with coils of wire fashioned after those of Phelps; still, this part of the wound broke down as soon as the patient got out of bed, and there is now at the site a bulging area about the size of half a walnut. It causes no trouble, however, so he will not allow a reoperation. Nothing of what is written here is meant in criticism of Phelps's valuable method; he probably never meant for it to be used where nothing but skin lies in front of the wire and nothing but peritoneum behind it. While I am far from considering lightly human health or comfort, still, I cannot repress a certain feeling of satisfaction over the reoccurrence of a hernia in the portion of this wound not covered by the filigree; nothing else could so perfectly demonstrate the value of the filigree as this living exposition of the difference between that portion of a wound thus protected and that to which no such protection is afforded.

CASE III.—Miss Y., aged eighteen years, was operated upon at St. Anthony's Hospital, July 1, 1902. She was a beautiful and accomplished young woman, whose plight was especially pitiable for these reasons. She had been operated upon for a suppurative appendicitis five years before, and the wound drained for weeks with gauze and rubber tubes. The unfortunate girl had had a hernia ever since getting out of bed; at the time I saw here there was a skin scar one and one-half inches broad by six inches long, which furnished but a thin covering for the hand as it was inserted through a large opening directly into the abdominal cavity. She had worn an abdominal "binder" from the time of the first operation, hence the hernia had been prevented from assuming large proportions. Even with this support she was unable to stand for more than a few minutes at a time; nor could she run, dance, skate, or engage in anything which required an actual exertion. She could not stand straight at all, while her subjective symptoms of weakness and discomfort were most marked. But it was only after removal of her supporter that the actual meaning of such a condition for an otherwise healthy young girl became apparent. She could not stand long enough for me to make a thorough examination of the old wound, and assured me that she had actually not been upon her feet, without the bandage, since the operation of five years before.

I excised the large skin scar, freshened the edges of the aponeurosis, dissected away scar tissue until I had a new muscle wound formed on one side by the rectus, on the other by the internal oblique, and replaced into the abdomen the sac, to the interior of which omentum was widely attached. The muscles could not be brought together without too much tension, so I placed a small filigree made like Fig. 2 on the floor of the defect, and then drew the muscles as nearly as possible together with four Halsted mattress sutures of gauge 23 silver wire. The edges met in three of the sutures, but the fourth left a gap of about an inch immediately over the filigree just mentioned. Upon the muscles I placed a filigree like Fig. 1, one and one-half by five inches in size, completely uniting the aponeurosis over this by a continuous suture of silver wire. After uniting the skin with a subcuticular suture, we put the patient to bed, where she lay for three weeks without an incident to mark the perfect recovery. She got up from bed a changed girl; there was no

feeling of weakness in the abdominal wall, nor any sense of discomfort whatever; she felt no desire for the old-time "binder," nor has she had it on since. The right side of the abdominal wall was, as far as her feelings went, exactly like the left, *i.e.*, perfect. This patient's brother informed me seven months after the operation that his sister then walked a mile to school every day, danced like other girls, and had skated the entire afternoon and evening previous to our conversation. Could one hear a more satisfactory commentary of the silver filigree? Nine months after the operation, I received a letter from the young lady, stating that she then weighed some twenty pounds more than she did when she left the hospital, and was otherwise in perfect physical condition.

CASE IV.—Mr. H., fifty-five years old, short, stout, and plethoric, had been operated upon for appendicitis one year before he came under my treatment; it had been a non-suppurative case, and the abdomen had in consequence not been drained, but sewn tight. Nevertheless a hernia had developed shortly after he left the hospital, and when I examined him I found three separate small sacs protruding with their contents of hollow viscera between the sites of the original through-and-through sutures. This patient, like the foregoing, was in constant misery; he suffered actual torment, though he wore a binder; was the subject of colicky pains or constipation all the time, and was, generally speaking, about as miserable as a man can be. I excised everything from the skin to the sac, at the same time freshening the aponeurosis and muscle edges as in the case just described. The openings into the sac were so small that I was afraid to reduce them lest an intra-abdominal constriction might occur. Three Halsted mattress sutures of wire closed the large opening in peritoneum and muscles, then upon the floor thus formed I placed a filigree like Fig. 1, six inches by two and one-half inches in size. Over this the aponeurosis was sewn with one continuous wire and the skin with another. This operation was done at St. Anthony's Hospital, July 28, 1902, and the patient left his bed at the expiration of three weeks a well man in every particular. I saw him eight months after the operation, when I was assured by him that he had never during that time been reminded of the presence of the filigree, nor had he been other than a perfectly well man as far as his abdomen was concerned. This for an elderly gentleman with a pendulous abdomen, who had suffered acutely.

CASE V.—Mr. P., sixty-seven years of age, was operated upon at the Lutheran Hospital, August 12, 1902. The old gentleman suffered from cirrhosis of the liver, with much ascites, and an umbilical hernia the size of a child's head. The heart and kidneys, however, manifested no evidence of change, so I determined to make his condition more bearable if possible. At the operation the sac was found to be filled with small intestines, which were reduced without difficulty through a ring two inches in diameter, there being but one small adhesion. All the coverings on the hernia were extirpated, the surfaces of the liver, spleen, and abdominal wall vigorously rubbed, and the omentum fixed according to Talma's method. Then the layers of the wall around the ring were carefully dissected apart, so that the peritoneum and posterior coverings of the rectus could be united in a single running wire suture. Upon the layer thus formed there was implanted a filigree corresponding to Fig. 1, the dimensions of which were five inches by two and one-half inches. The edges of the very atrophic rectus, together with the anterior sheath, were united over this contrivance with a continuous heavy wire suture. Upon this fibrous layer was fastened a filigree two and one-half inches square and the skin sewn over all. There were no untoward symptoms for four days, at the expiration of which time I departed for Colorado on my summer vacation. What was my surprise, upon returning to the city several weeks later, to learn that, eleven days after the operation, the patient, who was apparently doing well up to that time, had been seized with sudden nausea and expired in ten minutes. No autopsy was made, so I am at a loss for an explanation of the unfortunate occurrence.

CASE VI.—Mrs. S., aged forty years, was operated upon at St. Anthony's Hospital on the 20th of January, 1903, there being removed from the groin what proved to be a carcinoma. I excised skin, subcutaneous tissue, and aponeurosis as well as fascia lata from an area about the size of a man's palm, distributed two-thirds of it above Poupart's ligament, and extending from the superior anterior spine of the ilium most of the way to the spine of the pubis. The defect in the fibrous structures could not be obliterated by simple suture, and, fearing to trust to the muscles alone for maintaining the integrity of the abdominal wall, I implanted a filigree like Fig. 2, consisting of ten loops on either side. This was laid on the muscle floor of the wound, while over

its borders was drawn the edge of the aponeurosis and fascia lata, the crossing of the wires being attached to the stump of Poupart's ligament. A defect about one inch broad by three inches long remained in the fibrous covering of the filigree after the edges of these structures had been approximated as nearly as possible by a continuous wire mattress suture. The skin wound was completely closed by the Michel wound "clips." The recovery was uninterrupted; the patient was up in two weeks, walked without trouble, and there was no bulging. The abdominal wall remained intact up to the time of the patient's death from general carcinosis five months after operation.

Case VII.—Miss H., aged twenty-two years, colored, had been kicked in the right groin two months before I saw her, and had been in bed ever since. When she endeavored to stand up, there was a decided feeling of weakness in the right lower segment of the abdominal wall, accompanied by a sickening discomfort, which caused her to lie down for relief. She had noticed a bulging at the site of the injury, which corresponded fairly well to the inguinal canal; and, indeed, when she stood for me to examine her it was plain that she had not been mistaken in this particular, the lesion being subject to a pronounced impulse on coughing. The corresponding segment of the wall on the left side showed no evidence of change. It was clear that, though no pronounced herniation had occurred since she had remained in bed, something in the way of a repair must be instituted if the otherwise robust, healthy girl was ever to be of any use to herself or to any one else; so I operated at the Provident Hospital, February 28, 1903. The incision was made high, as recommended by Halsted in his operation for inguinal hernia. As soon as the aponeurosis was split, it was seen that the inguinal canal had not enough intact muscle substance in its posterior wall to prevent the hand pushing the peritoneum before it through a large opening into the abdominal cavity. I had little confidence in the thinned-out muscle, so made no attempt to use it in closing the opening, preferring to merely place a filigree of the style in Fig. 2 on the floor of the defect, and to sew the aponeurosis over it with a continuous silver wire. One side of the contrivance was covered by the shelving edge of Poupart's ligament, and the other extended well up between the internal oblique and the aponeurosis. It was two and one-half inches broad and about

three and one-half inches long when sewn in place; the adjustable feature of it seeming to me an advantage when used in this locality, because this renders it easier of insertion. The skin was united with the Michel wound "clips," and the girl made a perfect recovery, her wound, like all of the other six, having healed by first intention throughout. In two weeks she left her bed without a feeling of weakness or discomfort, and was able to walk for the first time since the injury, some ten weeks previous to this time. I learned from her family physician, some four months after the operation, that her abdominal wall was still in perfect condition, though there is a slight feeling of stiffness in the scar, as she expresses it, this being particularly noticeable when the thigh is strongly flexed upon the pelvis.

My results have been the legitimate outcome of the operations alone; there have been no favoring circumstances to which may be attributed a share in preventing the expulsion of the filigree by the intra-abdominal tension. I mean by this that I have not allowed one of my patients to wear any sort of binder or support or abdominal bandage after the operation, preferring to put the filigree solely on its merits.

It will be seen from the foregoing that I have done this comparatively new operation seven times, and have seen uniformly perfect results in all but one case. Here the slight partial bulging which resulted under the influence of an ascitic collection was in no sense the fault of the method, but due, on the other hand, to a technical flaw. This was the first instance in which I had inserted a ready-made filigree, and in my inexperience I made it too short. Then in inserting it I fully covered the lower angle of the wound, since I realized that the greatest intra-abdominal pressure must come at that point. I had measured this man's scar and hernial opening before manufacturing the filigree, but learned, during this my first operation of the sort, that a proper dissection in such a case requires that the new wound must be made *much* larger than the old scar. Based on this, I should advise others to make the filigree at least one and one-half times longer than the scar which it is to replace.

I have been able to observe my seven patients after operation, respectively, two years, one year, eleven months, five months, four months, three and one-half months, and eleven days, and must say that I have not had to remove a filigree, nor have I seen any disturbance which might be taken to indicate that such a contrivance could not rest indefinitely in its new bed.

The logic of the operation is simple; in it we place no dependence on preformed tissues; in fact, we entirely leave them out of consideration and pin our faith on a new scar, which is prevented from stretching under tension by unyielding silver wires distributed through it in the proper direction.

My opinion of this recent idea in surgery, after giving it the test which I have, cannot be expressed too enthusiastically. The filigree renders easy something which would in many cases be otherwise impossible. By its use hopeless invalids may be restored to health and activity. Of all the various forms of netting which have been used, the simple ones of cross-wires proposed herein appeal to me as being the only ones which are free from the evident disadvantages inherent to any sort of plate, such as a stiff filigree really is,—one made up of wires which are equidistant and running in both directions.

THREE SUCCESSFUL LAPAROTOMIES FOR INTESTINAL PERFORATION IN TYPHOID FEVER.[1]

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I WISH to report briefly three cases of perforation of the intestine following typhoid fever which were operated upon and recovered. These three cases occurred out of a series of thirteen in my service at the Episcopal and Pennsylvania Hospitals.

CASE I.—December 4, 1900, Episcopal Hospital. Male, aged twenty-nine years. Perforation in the third week of the disease. Since being in bed has had some sharp pain in lower abdomen. At 11 A.M. had a sharp, severe pain in the hypogastrium immediately after using the bedpan. Two hours later had a severe chill, after which the pulse became rapid and weak. The abdomen was hard, rigid, tender, and painful. I saw the patient in consultation about that time and advised immediate operation, but, owing to delay in obtaining permission from his family, he was not operated upon until five and one-half hours from the time of perforation.

Operation.—Ether. Incision along the right rectus muscle. On opening the abdomen a large amount of turbid fluid escaped; intestines and omentum red and congested; appendix adherent but not perforated. After the withdrawal of a number of coils of ileum, a small perforation was found about ten inches from the cæcum, apparently the centre of a Peyer's patch that was ulcerated, and which was easily closed with silk. A small amount of fæcal matter had escaped, which was easily washed off with hot salt solution. After the abdomen and pelvis were thoroughly douched with normal salt solution the intestines were replaced.

[1] Read before the Philadelphia Academy of Surgery, April 6, 1903.

A glass drainage tube was carried well down into the pelvis, and the wound partially closed. The appendix was removed. Temperature, $103^{3}/_{5}^{\circ}$ F.

The convalescence was slow. In about three weeks the wound was closed. A week later the patient developed an empyema, which necessitated the introduction of a large drainage tube into the pleural cavity. Cultures from pus showed colon bacilli, streptococci, and bacillus fœtidus. The patient rapidly recovered, and was discharged cured eighty-three days after operation for typhoid perforation.

Case II.—Male, thirty-nine years of age. Pennsylvania Hospital. Admitted May 4, 1902. Had been sick for about ten days. On admission presented symptoms of peritonitis. Abdomen was tender and board-like. As soon as possible the patient was prepared for operation. Under ether, incision was made on edge of right rectus muscle; on opening abdomen about two pints of lemon-colored fluid escaped with flakes of lymph. Appendix much swollen and congested and was removed. Some distance from the cæcum a perforation was found in the ileum, which was closed with two rows of Lembert silk sutures. Much fæcal matter had escaped. The abdomen was flushed out with hot salt solution, followed with equal parts of normal salt solution and hydrogen peroxide, and finally with normal salt solution, being then packed with five large pieces of gauze and the wound left open. On the third day after operation the packing was removed. The condition was good; abdomen flat. The gauze was replaced. Two weeks later temperature was normal, wound clean, but not healed. When apparently convalescent, the patient had a typical typhoid relapse, and was removed to the medical ward, where he had a second relapse two months after admission. He was discharged cured three months after operation, with slight ventral hernia.

Case III.—Male, aged thirteen years. Pennsylvania Hospital. Operation, May 11, 1902. Patient was admitted to the medical ward with typhoid fever on April 4; present illness began on March 28. Ten days before admission had had headache, backache, cough, epistaxis, and diarrhœa. On admission, spleen was enlarged, abdomen soft and flat, temperature high. On the forty-sixth day of the disease the abdomen became distended and tender, with great muscular rigidity, although there was no marked evidence of any sudden perforation. Operation was ad-

vised, although the patient's condition hardly warranted surgical interference. Ether. Rigid cyanotic abdomen, with intense tenderness, rapid dicrotic pulse, and cold extremities. Incision on right side permitting the escape of about half a pint of straw-colored fluid and flakes of lymph. Appendix found in an ounce of pus, gangrenous and perforated, and was ligated and removed. On examination of the ileum, two perforations were found with some escape of fæcal matter, and closed with silk sutures. Abdomen and bowel irrigated with hot salt solution, then with equal parts of salt solution and hydrogen peroxide, and finally with normal salt solution. Abdomen packed with large pieces of gauze; wound left open.

The convalescence was protracted and interrupted by two distinct relapses. The patient was finally discharged cured over three months from time of operation. Abdominal wound quite firm.

In reviewing these three successful cases, it will be noticed that they represent one from each of the three classes that are ordinarily brought to the surgeon's notice for operation. In the first one the perforation occurred during the middle of the disease with the patient in good condition, and was immediately recognized and operation advised. The only delay which arose was waiting for the consent of the patient's family, during which time the patient lost considerable ground. The second was of the ambulatory character, coming on suddenly in a patient who was not much exhausted from the effects of the disease, and presenting many of the characteristic symptoms of an acute appendicitis with perforation. This class is decidedly the most favorable for operation, and from it the greatest number of recoveries will be gathered. The third class is the most unfavorable, as the vital energies are almost entirely exhausted as the result of a prolonged and exhausting disease; and it is in these cases that the greatest difficulty is experienced in arriving at an accurate diagnosis whether perforation really does exist or not. Nevertheless, this third class illustrates how ill a case can be when operated upon and yet recover.

The key-note of success in dealing successfully with typhoid perforations is the early recognition of the lesion. At the best this is a most difficult procedure, and the diagnosis can best be made by the medical attendant who has carefully followed the case from the beginning, noticing all the trifling changes that occur in the abdomen. When any undue symptom arises, the surgeon should immediately be consulted, and with his aid and the carefully acquired knowledge of the medical attendant a correct diagnosis can generally be made. The classic symptoms of perforation when well marked can hardly be mistaken, such as pain, tenderness, rigidity, shock, chill, facial expression, and all the symptoms of peritonitis. To make an accurate diagnosis of perforation in the early stage, the medical attendant must be thoroughly conversant with the condition of the abdomen, and must be alert for the first symptom of muscular rigidity, which is one of the earliest and most important signs of intraperitoneal irritation.

Rigidity and spasm are terms so loosely used and so difficult of apprehension that it is not easy to reconcile oneself to these recorded statements. I believe that rigidity as understood by the surgeon differs from that interpreted by the physician, and, as just stated, is most difficult to properly estimate its significance in many cases; but if this sign is rightly interpreted, it is the key-note to the early detection of a perforation in a large proportion of cases. The ideal method would be for the surgeon to see regularly, in conjunction with the physician, all cases of typhoid fever day by day. The leucocyte count has proven of very little value at the time when most needed.

Cases with hæmorrhage are most perplexing, as these two conditions—hæmorrhage and perforation—may exist together, although they did not occur in my series. The absence of liver-dulness and the presence of flank-dulness are late signs, and are of little corresponding value. The facies is of value if carefully noted by the person in attendance, but is difficult to read by a stranger until peritoneal involvement is very marked.

Shock is regarded by some as an important symptom, and is undoubtedly present if sufficient time is allowed for its devel-

opment. No time should be wasted hoping that reaction will take place, for as every hour passes the greater will be the leakage from the intestine, causing greater soiling of the peritoneum. Immediate operation will enable us to prevent further soiling of the peritoneum, to repair the injury to the bowel, and reduce the danger of septic inflammation by suitable toilet followed by drainage, and also combat the existing shock and aid reaction by douching the abdominal cavity with hot salt solution.

Immediate operation should be urged even in the presence of profound shock, as every hour of delay proportionately decreases the chances of recovery.

The incision is preferably made on the right side, and is almost sure to lead down to the seat of perforation, which is always within a short distance of the cæcum. In hunting for the perforation, it is a good rule to start with the cæcum and appendix; then the last three or four feet of the ileum are examined, and as much of the ascending colon as can be exposed. If no signs of peritoneal infection are recognized during this examination, an error in diagnosis has been made, and further operative interference should be discontinued. If, however, signs of peritonitis are apparent, and the cause is not detected, a median incision should be made so that the entire length of the colon and the remaining small bowel can be carefully examined. A perforation may be easily hidden from sight by a piece of lymph, therefore all portions of the bowel that are indurated or covered by lymph should be carefully examined. It is safe to say that the lateral incision will be found the most satisfactory in 95 per cent. of cases operated upon. Out of 332 cases which I have carefully analyzed, in ninety-six the median incision was made with a mortality of 78.12 per cent. In the right lateral incision there were 123, with a mortality of 68.37 per cent. In the other cases operated upon, the site of incision was not mentioned. The more improved technique has undoubtedly reduced the mortality in these operations, which will be noticed in the appended table.

TYPHOID PERFORATION.

Recovered, 87; died, 245; total, 332; mortality, 73.79 per cent.

Operations.	Recovered.	Died.	Total.	Mortality.
1884–1888	1	9	10	90 per cent.
1889–1893	2	14	16	87.5 per cent.
1894–1898	28	82	110	74.5 per cent.
1899–1903	45	101	146	69.1 per cent.

In fifty cases, year of operation not stated.
Mortality for male sex, 78.5 per cent.
Mortality for female sex, 61.4 per cent.

When the perforation has been found and its closure will not produce too great stenosis of the bowel, it should be rapidly closed with silk sutures in whichever direction, either transversely or longitudinally, to the lumen of the bowel which produces the least narrowing of the gut. No time should be wasted on attempting to trim or freshen the edge of the ulcer, as the area of the bowel near a perforation is always so friable that stitches are liable to tear out. The best stitch for this purpose is the so-called mattress suture, as a running Lembert is liable to cut or tear through the friable tissues. When the opening is closed, the bowel should be carefully inspected for other perforations, as not infrequently these openings are multiple. Often dark necrotic spots will be found where the ulcer has destroyed the coats of the bowel down to the peritoneum, giving the appearance that in a short time another opening would be formed. All such suspicious places should be treated as though a perforation had taken place, and the weakened area fortified by being folded in with stitches. Occasionally, cases will be met with where the opening in the bowel is too large or the area inflamed too great, so that closure is not practicable. When this condition exists, there are four procedures offered. First, a plug of omentum may be so fashioned and stitched against the opening in the bowel as to form a simple patch, after the manner in which Nature sometimes deals with these conditions. Second, resection of the

bowel and an end-to-end anastomosis either with stitches or with a Murphy button, the latter being much more rapid. Third, the formation of an artificial anus by stitching the bowel to the abdominal wall, and, fourth, cutting off the damaged area of the bowel from the general peritoneal cavity by carefully placing pieces of gauze between the folds of the bowel.

The cleansing of the peritoneum and drainage are the most important procedures. It has been decided by some that when only the right lower quadrant of the abdomen is infected, the intestine should be brought outside of the abdomen and carefully cleansed with salt solution and gauze sponges, while the cavity within is sponged dry.

My best results have been where the peritoneum has been dealt with by vigorously flushing with salt solution, then with equal parts of salt solution and hydrogen peroxide, and finally douching with normal salt solution. This is best done by carrying a large tube down into the pelvis, and with vigorous flushing all foreign matter can be much more easily removed than by attempts at dry sponging. After the intestines are carefully replaced in the abdomen, a number of large gauze wicks are carried down to the bottom of the pelvis and to the different parts of the abdomen between the coils of intestine, so as to secure good free drainage. Little or no attempt should be made to close the abdominal wound, except it has been unusually large, when a couple of sutures at the upper angle can be introduced. The wound should have a liberal dressing of gauze applied over it, as it will in a short time become thoroughly saturated with fluid from the abdominal cavity through the medium of the gauze drains. These should not be disturbed for three or four days, after which time they can be removed without much difficulty by thoroughly saturating them with salt solution or hydrogen peroxide. They then should be replaced with a fresh gauze pack, which may be of less quantity, according to circumstances.

In reviewing my work in this gloomy field of surgery, I feel convinced that there are two important factors to be carefully considered. First, the early recognition of the lesion and

dealing with it as rapidly as possible, in order that as little time as possible will elapse from the time of perforation until operation has been performed; and, second, that the operation should be so planned, since time is so important an element, that not a moment should be wasted during it, the technique being of the simplest character, as every moment of delay will cause a much higher percentage of mortality.

THE SURGICAL FEATURES OF PERFORATION OF THE INTESTINE IN TYPHOID FEVER IN CHILDREN.[1]

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In 1898, Keen, in a monograph on the surgical complications of typhoid fever, collected eighty-three cases of typhoid perforation of the bowel which had been operated upon. In 1900 he published a paper on the same subject,[1] and reported 158 cases gathered from medical literature with 23 per cent. of recoveries. Up to March, 1903, I have found 131 additional cases, making 289 in all, with seventy-five, or 25.9 per cent., recoveries. Twenty-five of the patients were less than fifteen years of age.

During the past year I have operated upon a case of typhoid perforation of the intestine in a child of six and one-half years of age, the history of which follows:

Typhoid Fever; Intestinal Hæmorrhage; Perforation of the Intestine on the Thirty-third Day; Laparotomy and Suture of the Perforation; Recovery.—Becky H., six and one-half years of age, was admitted to the children's medical service of Dr. Koplik during the service of Dr. Heiman on July 26, 1902. The child was in the fourteenth day of a fairly severe attack of typhoid fever, with temperatures rising from 104° to 105° F. every evening, a pulse of 130 to 150, and respirations of 36 to 42. There was a well-marked Widal reaction in a dilution of 1 to 50.

On August 4, the twenty-third day of the disease, the patient had a small intestinal hæmorrhage, and at the same time developed a purulent discharge from both ears. The leucocytes varied between 7000 and 11,000.

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[1] Read at the meeting of the Pædiatric Section of the New York Academy of Medicine, April 9, 1903.

On August 13, the thirty-second day of the disease, the temperature dropped in nine hours from 102.4° to 97.6° F., and the patient had several fluid blood-stained stools. At nine o'clock in the evening the patient had a severe chill followed by a rise of temperature to 104.6° F. and of the pulse to 160.

At 1 A.M. of August 14, the thirty-third day of the disease, the child complained of abdominal pain, and the abdomen was found to be slightly tender, but not rigid or distended. Leucocytes, 11,000.

At 9 A.M. the temperature had again dropped to 101.2° F. and the pulse to 148. The abdomen was found to be slightly distended; there were slight general abdominal tenderness and rigidity; the area of liver-dulness was somewhat diminished. At 2 P.M. the temperature was 99.6° F.; at 3 P.M. it was 102.4° F.; the pulse 140, and of very poor quality.

Surgical consultation at 4 P.M. The child was lying in bed with a pinched and anxious face, its thighs flexed upon the abdomen, and crying with pain. Abdomen considerably distended and fairly rigid; general abdominal tenderness most marked on the right side; liver-dulness partly obliterated; some dulness on percussion in the flanks; the child has just vomited. Temperature, 104.4° F.; pulse, 160; respiration, 40; leucocytes, 18,000. The diagnosis of perforation was concurred in and the patient transferred to the surgical service of Dr. Lilienthal for immediate operation.

5.30 P.M., chloroform anæsthesia; incision three inches long along the outer border of the right rectus muscle; peritoneal cavity found to contain gas and a large quantity of cloudy, inodorous fluid. Several distended and injected loops of small intestine presented in the wound and were packed aside with gauze. A perforation in the wall of the ileum was found about twenty centimetres from the ileocæcal junction; the opening was about the size of a pin's head, and thin yellow fæcal matter was oozing from it. The perforation was closed by a double layer of Lembert sutures passed in the long axis of the bowel. As no other perforations were found, the peritoneal cavity was sponged out as thoroughly as possible and the abdominal wound closed with through-and-through sutures of silkworm gut, a small drain having been inserted in the lower angle. Duration of the operation, eleven minutes.

At the completion of the operation the pulse was 200 and

hardly perceptible; after energetic stimulation it dropped to 180, and improved in quality.

August 15. Temperature, 100.4° to 104.4° F.; respiration, 40 to 28; pulse, 160 to 140; general condition poor; delirium; some vomiting; small quantity of gas expelled after enema.

16th. Temperature, 99.6° to 102.6° F.; respiration, 30 to 28; pulse, 148 to 138; no vomiting; pulse improved in quality.

17th. Large furuncle on left hand incised; no vomiting; abdomen soft and hardly tender; fluid nourishment taken well.

19th. Profuse discharge of pus containing staphylococcus aureus from both ears; scalp shaved and numerous abscesses on scalp opened; abdominal wound has healed by primary union except for drainage opening; drain and some of the sutures removed; leucocytes, 9000.

August 27. For the past week the temperature has fluctuated between 98.6° and 102.6° F.; the pulse between 110 and 130; the respirations between 26 and 30. All abdominal symptoms have disappeared; the abdomen is soft and not tender; the bowels have moved regularly; large quantities of fluid nourishment have been taken.

On the 21st several new abscesses on the scalp and on the 27th a large abscess in the left axilla were opened. The pus from the various abscesses contained the staphylococcus aureus in pure culture.

August 29. General condition good; temperature, pulse, and respiration practically normal; leucocytes, 9000; profuse vaginal discharge containing the bacillus typhosus in pure culture (Dr. Bernstein); discharge from ears has ceased after appropriate treatment; patient has gained considerable flesh and strength.

September 2. Temperature, 98.4° to 100.2° F.; respiration, 22 to 28; pulse, 106 to 120; vaginal discharge has ceased entirely after boric acid douches; abdominal wound firmly healed. The patient was retransferred to the children's service, from which she was discharged cured about two weeks later.

The entire credit for the early recognition of the perforation is due to Dr. Heiman, and to the house physician, Dr. M. Gershel, who studied every symptom with the most scrupulous care. The case presents a few special features of interest.

The child is the youngest on record that has been operated on for typhoid perforation. We have been unable to find the record of any case of vaginal discharge which contained the typhoid bacillus in pure culture, and I consider the case in this respect a unique one. The infection was probably derived from the rectum, perhaps from the thermometer.

The following notes have been kindly furnished me by Dr. E. Bernstein, assistant in the pathological laboratory of Mt. Sinai Hospital, who isolated the typhoid bacillus from the vaginal discharge in the patient. "While the number of cases of infection due to the typhoid bacillus in the male genital organs is comparatively large, the number of such affections in the female is surprisingly small. Particularly is this true of the external genitals.

"Typhoid infections of the uterus have been reported by Blumer,[52] Dobbin,[53] and two cases by Lartigau.[54] Richardson[55] gives an account of two cases of abortion in typhoid patients, in which he isolated the typhoid bacillus from the placenta, and from the liver, kidneys, and heart of the fœtuses. Williams[56] succeeded in establishing the presence of the Eberth bacillus in the lochia of a typhoid patient suffering from puerperal sepsis.

"Of ovarian infections the number is still smaller, all being ovarian cysts infected by the typhoid bacillus. Thus, Werth,[57] Sudeck,[58] Pitha,[59] and Wallgren,[60] each report such a case. Unfortunately, Mabit's[61] case of typhoidal pyosalpinx was not controlled by bacteriologic examinations, and therefore cannot be considered.

"Lartigau[62] gives a very interesting description of a young girl suffering from typhoid fever, who developed multiple ulcers on the vulva and vagina due to this bacillus, while Takaki and Werner[63] report a case of post-typhoidal abscess of the Bartholinian gland, from the pus of which pure typhoid bacilli were obtained.

"Our case is unique in being a pure typhoidal vaginitis, without ulceration or abscess formation. The typhoid bacillus was obtained in pure culture from the vaginal discharge, and corresponded in all respects—both in culture and agglutination characteristics—to the Eberth bacillus."

According to the reports to be found in medical literature, there seems to be a wide diversity of opinion regarding the frequency of typhoid perforation of the intestine in children. Morse[2] did not see a single case among 284 children with typhoid fever (7.7 per cent. of the entire number of cases of typhoid fever) at the Boston City Hospital, while Fitz[3] saw seven among 192 children with this disease (3.6 per cent.). Among 1028 cases of typhoid fever in children collected by Holt[4] perforation of the intestine occurred twelve times (1.1 per cent.). Of 232 cases of typhoid perforation collected by Barthey and Rilliet[7] only three occurred in children. Among 289 cases of laparotomy for typhoid perforation gathered by the writer, twenty-five, or 8.6 per cent., were in children under fifteen years of age. If we combine the numbers given by Morse, Fitz, and Holt, we obtain 1504 cases with twelve, or 1.2 per cent. of perforations, and if we compare these figures with those for adults (perforation occurs in 1–2½ per cent. of all cases of typhoid fever according to most authors), we see that the frequency of this complication in the young is not far behind that in adults. With due consideration of the variations in the severity of the disease in different countries and in different epidemics, we must conclude that perforation is not so very rare in childhood, certainly not as infrequent as has been claimed by some authors (Henoch,[5] Baginsky,[6] Morse,[8] etc.), and that therefore severe forms of the disease are more frequent than is generally believed.

Writers on the diseases of children agree that most cases of typhoid fever in the young run a very mild course. The disease is usually of shorter duration, the intestinal lesions are often not as well marked, and ulceration is frequently absent.

In children, the pulse-rate is usually high during the entire course of the disease. According to Osler,[11] the abdomen is more apt to be distended in the young, though generally only in a moderate degree. Osler states that relapses are more likely in children, and that they more frequently complain of

abdominal pain. It is well known, also, that nervous manifestations are very frequent.

The writers from Johns Hopkins Hospital (Osler,[12] Finney,[13] Cushing,[14] McRae and Mitchell[15]) and others (Shattuck, Warren, and Cobb,[16] etc.), who have made careful studies of the early symptoms of perforation, believe that the attempt should always be made to distinguish between the symptoms of perforation and those of the resulting peritonitis. In many, if not most, cases this distinction cannot be made. The only symptoms of *perforation per se* that we could conceive of, are sudden pain and perhaps sudden abdominal distention and collapse. In the majority of cases, the diagnosis of perforation is mainly made from the symptoms and signs of a sudden affection of the peritoneal cavity itself, that is of a beginning peritonitis.

It is seldom possible to make a diagnosis of impending perforation with sufficient certainty to justify operative interference in this stage (the so-called preperforative stage of Cushing[9]). When such symptoms are present, it must almost always be impossible to differentiate a preperforative stage from an early stage of perforation.

In what follows I shall make no distinction between the symptoms that might be directly due to the perforative lesion of the bowel and those of the early changes in the peritoneal cavity. Nor will the attempt be made to give a full description of the symptoms of perforation in children, which are in most respects similar to those described in adults. Mention will be made of only a few features in which the symptoms in the young differ somewhat from those in more advanced age.

Age.—Of the twenty-five patients operated upon, fourteen were between nine and twelve years of age. The ages of the patients follow: six and a half years, one; seven years, two; eight years, three; nine years, four; ten years, four; eleven years, three; twelve years, three; thirteen years, three; fourteen years, two; fifteen years, one.

Sex.—Eighteen of the patients were of the male sex, six were females, and in one patient the sex was not given. This

predominance of the male sex in childhood is of interest. Of the 158 cases of laparotomy for typhoid perforation collected by Keen,[17] 84 per cent. occurred in males. According to Osler,[18] males and females are about equally susceptible to typhoid fever, but male patients are more often admitted to hospitals. As most of the statistics are collected from hospitals, the predominance of perforation among the males can be partly, but not altogether, explained by the greater frequency that males apply to hospitals for treatment. The fact that 72 per cent. of the children with perforation were of the male sex cannot, however, be explained on the same basis.

General Symptoms.—Facies.—A decided change in the appearance of the face was noted in eleven of the twenty-five patients. In three, the facial appearance of the child remained unchanged for a considerable time after the appearance of other symptoms suggestive of perforation of the intestine. In ten patients no mention of the facies is made. The expression is described as pinched, anxious, collapsed. The change in the facial appearance never occurred early; it was usually observed after a number of other symptoms had directed attention to the possibility of perforation.

The primary shock of perforation is less evident in children than in adults. Children seldom show the sudden symptoms of collapse that are so frequent in adults. The pinched, anxious, collapsed appearance of the face appears only with the increasing infection of the peritoneum, and has only a proportionate value as a symptom of peritonitis.

Temperature.—In most of the cases the temperature curve showed nothing characteristic. The temperature either remained high or there were marked fluctuations. In four patients there was a sudden fall of temperature to the normal or subnormal at or soon after the perforation. Two of the patients had an intestinal hæmorrhage just before the rupture of the bowel, so that the fall in the temperature was possibly due to the bleeding from the intestine.

Pulse.—In fifteen of the twenty-five cases, the pulse is described as having become more rapid and of poorer quality

very soon after the occurrence of the perforation. In five patients the change was said to have been a sudden one at the time of perforation. In one patient (Case IX) there was no change in the character and frequency of the pulse between the time of perforation and the operation.

Respiration.—The changes in the frequency of the respiration were insignificant in all the patients until well-marked symptoms of peritonitis had developed.

Vomiting was present as an early symptom in only four patients. The longer, however, the delay in the operative interference, the more often did vomiting appear. In several patients there was no vomiting in spite of advanced peritonitis.

Leucocytosis.—Notes of leucocyte counts are given in only five cases. In five patients frequent leucocyte counts were made, and in all five there was a sudden or gradual increase in the number of white cells. The lowest count was 9000 and the highest 28,000. The fact that in all five cases a more or less marked leucocytosis was present might be considered significant, were it not for the fact that numerous cases have been reported in which there was no perforation, although abdominal symptoms and leucocytosis were present. Thus, McRae and Mitchell (*Johns Hopkins Hospital Reports,* Vol. x, Nos. 6–9) report two cases of this kind in children of twelve years of age. In one patient the symptoms were due to abdominal distention and the leucocyte count was 9700; in the second, the abdominal symptoms followed an intestinal hæmorrhage and the leucocyte count was 12,000. Just before, and for a short time after, the perforation the number of leucocytes in the blood is probably always increased, but when infection of the peritoneal cavity begins there is a great outpouring of leucocytes into the peritoneum, and the number in the blood becomes rapidly diminished. If the leucocyte counts be made during the first period, a marked increase may be noted and may be of value as confirmative evidence, but the cases of McRae and Mitchell and others of the same kind show that the presence of a leucocytosis can be used only with circum-

spection as a diagnostic symptom, while the absence of a leucocytosis does not exclude the possibility of perforation.

Local Symptoms.—Pain.—In every case in which details are given (twenty of our series), the sudden appearance of pain is mentioned as the first symptom which called special attention to the abdomen. The pain was usually localized in the lower part of the abdomen, especially on the right side. In two patients the pain was limited to the right iliac region, in five others there was general abdominal pain. In most of the patients the pain occurred in paroxysms, in a few it was constant and varied little in degree.

Tenderness on palpation was present in every case, but there seems always to have been an appreciable interval between the first appearance of pain and the appearance of this abdominal tenderness. The abdomen was most tender in the right iliac region in six cases.

Appearance of the Abdomen.—Changes in the appearance of the abdomen were noted in all but three of the twenty-five patients. In three cases there was no abdominal distention. In nine patients there was "considerable" distention, in one patient the distention was "enormous." All the other patients had only a moderate degree of distention, no more than was often seen without perforation.

Rigidity of the abdominal muscles was more or less marked in fourteen patients.

Obliteration or well-marked diminution in the *area of liver-dulness* was noted in only five cases.

This short account of the main symptoms in the twenty-five cases of our series shows that there is no essential difference between the symptoms of perforation in children and in adults. Sudden pain or increase of the existing pain is generally the earliest and most prominent symptom, perhaps with abdominal tenderness and rigidity. Changes in the temperature and pulse, leucocytosis, vomiting, diminution in the area of liver-dulness, etc., have in most cases only confirmatory value. The collapsed appearance which is presented by many adults with typhoid perforation is rarely seen in children ex-

cept in the presence of advanced peritonitis. As a moderate amount of tympanites is more apt to be present during the entire course of the fever in the young, a slight increase in the distention may occur at any time without having any significance, and with this there may be a diminution of the area of liver-dulness due solely to the distention. In most cases it is not one or the other symptom, but the *ensemble* of symptoms which must lead to the diagnosis. When, in addition to the facts that have been mentioned above, we remember that children are not as well able to describe or localize their symptoms, it will be easily understood why the diagnosis of perforation is often exceedingly difficult, and why in children errors in diagnosis may the more easily occur.

A considerable number of cases have been reported which presented the so-called characteristic symptoms of perforative peritonitis but recovered without operation, and not a few cases have been published in which laparotomy was done and a peritonitis, but no perforation found. Peritonitis may occur with deep ulceration of the bowel and changes in the serous coat, but without perforation or other discoverable abdominal lesion. Cases of this kind have been reported by Cushing,[19] Finney,[20] McRae and Mitchell,[21] Herringham and Bowlby,[22] and others. On the other hand, it cannot be denied (as was done by Henoch [23]) that after typhoid perforation of the intestine recovery may take place without operation. The opening in the bowel may become closed by fibrin, by adhesions of omentum or other coils of intestine, or a localized abscess may form and be discharged through the bowel. Fitz,[24] Keen, and Murchison believed that 5 per cent. of the patients with perforation of the intestine in typhoid fever recover without operation. Fitz, however, says that "since suggestive, even so-called, characteristic symptoms may occur without any perforation having taken place, it must be admitted that recovery from such symptoms is no satisfactory evidence of recovery from perforation." Notwithstanding the obvious truth of the foregoing statement, it is certainly possible that recovery may take place without operation. During the past year the writer

had occasion to see a child that presented all of the characteristic symptoms of perforation in typhoid fever, in which permission for operation was refused, and which recovered without operation. For the kind permission to make use of the records of this case I am indebted to Dr. H. Koplik, Attending Physician to the Children's Service of Mount Sinai Hospital. The history of the case follows:

H. R., male, twelve years of age, was admitted to Mount Sinai Hospital on the children's service of Dr. Koplik on October 2, 1902. The boy was in the eleventh day of his typhoid fever, with a temperature of 103.8° F., a pulse of 106, and respirations of 26. The spleen was enlarged to percussion and palpation, the abdomen was slightly distended and tender. Leucocytes, 5000. There was a well marked Widal reaction in a dilution of 1 to 50.

For four weeks the disease ran the course of an attack of typhoid fever of a fair degree of severity. The temperature began to fall after the second week, and by October 24 reached the normal, or near the normal, every morning. Slight abdominal distention, tenderness, and rigidity persisted, but with the fall of the temperature became less marked. The leucocyte count varied between 6400 and 7000.

November 4. Forty-third day of the disease; child does not look as well as usual this morning.

November 4, 4 P.M. Temperature, 100.2° F.; pulse, 104; patient complains of severe abdominal pain, most marked in the umbilical region. The abdomen is generally tender, but the tenderness is most marked in the right iliac region; the abdomen is slightly distended, and the muscles are more rigid than they have been; leucocytes, 14,000.

4.30 P.M. The patient has vomited several times.

6 P.M. Temperature, 102° F.; pulse, 116 to 128; the abdominal pain has continued; physical examination of the abdomen is about the same as when last noted; on rectal examination, the right side of the pelvic cavity is distinctly more tender than the left; patient's general appearance is distinctly worse.

9 P.M. Temperature, 104° F.; pulse, 120 to 124; leucocytes, 13,000; patient is complaining of violent abdominal pain; liver-dulness not diminished; no dulness on percussion in the flanks.

November 5, A.M. Temperature, 103.8° F.; pulse, 124 to

130; respiration, 32; patient has not vomited for the past eighteen hours; abdominal pain persists with unabated severity; liver-dulness somewhat diminished; distention of abdomen slightly increased; right iliac fossa very tender on palpation; abdominal muscles very rigid.

3 P.M. Temperature and pulse still high; abdominal pain persists; area of liver-dulness considerably diminished; abdominal distention much more marked; entire abdomen extremely tender to palpation and percussion; slight dulness on percussion in both flanks; patient looks very badly and is somewhat cyanosed. At this time the patient was seen by Dr. Lilienthal, attending surgeon in consultation with Dr. Koplik. The diagnosis of perforation of the intestine was concurred in and immediate operation recommended, but permission for the operation was refused by the child's parents.

November 6, A.M. General condition poor; temperature, 104° F.; pulse, 140; heart sounds weak; abdomen more distended and very tender to percussion and palpation.

November 7. In the morning the patient still complained of much abdominal pain and the physical signs in the abdomen were unchanged. The patient had several voluntary fluid movements of the bowels. No vomiting. In the afternoon the pulse became less rapid and of better quality, and the abdomen was distinctly less tender and rigid and less distended. The tenderness was now most marked in the right iliac region, where there was a small area of localized dulness on percussion; leucocytes, 5800.

In the evening the abdomen was very much less tender and the patient's general condition very much improved; the temperature had dropped to 98° F. and the pulse to between 80 and 90.

November 8. Temperature, 98° to 100° F.; pulse, 70 to 86; respiration, 24 to 26; patient's condition is fairly good; he looks much better; the abdominal signs are very much less marked; there is now only slight tenderness in the right iliac region; pain is no longer complained of.

After this time the course of the disease presented nothing of special interest. For several weeks the leucocyte counts varied between 7000 and 13,000. All of the abdominal symptoms rapidly disappeared and convalescence was well established by December 1.

The patient was discharged cured on December 10.

In the opinion of every one who saw this patient, he presented all of the so-called characteristic symptoms of a sudden perforation of the intestine in the course of typhoid fever, and he would surely have been operated upon if permission for the laparotomy had been obtained. Every symptom and sign characteristic of perforation—marked abdominal pain, tenderness and rigidity, distention, diminution in the area of liver-dulness, dulness on percussion in the flanks, changed appearance of the face, rapid, poor pulse, vomiting, leucocytosis—were present. Although we must acknowledge that the only certain proof of perforation of the bowel would have been the demonstration of the same at an operation, we cannot but feel justified in considering the case one of perforation, and recovery without operation, on account of the presence of every symptom and sign which are considered typical and characteristic of perforation. It is possible that the case was one of perforation of an ulcer of the appendix—that is, of so-called typhoid appendicitis,—an affection in which the tendency to localization of the process and spontaneous resolution is much greater than in perforation of the small intestine.

Time of Perforation.—The perforation occurred during the first week in no cases; second week, in 2 cases; third week, in 10 cases; fourth week, in 2 cases; fifth week, in 3 cases; sixth week, in 3 cases; a relapse in 4 cases; (?) in 1 case.

Perforation took place, therefore, most often during the third week and during a relapse. One of the cases noted above as having occurred during the third week was reported as having taken place "some time during the second or third week."[10] While the physician who treats a case of typhoid fever in a child should always be on the lookout for abdominal symptoms, it is more especially during the third week of the disease and during a relapse that this abdominal complication is apt to occur. The abdomen should be frequently examined, and even the seemingly most trivial changes noted. If there has been diarrhœa or well-marked tympanites throughout the disease, or if the patient has had an intestinal hæmorrhage, no matter how small in amount, there is a much greater chance

of perforation. The conditions just mentioned are more apt to occur with deep ulceration of the bowel, and their presence is generally an evidence of the severity of the intestinal lesions.

The Time of Operation.—The shortest interval between the first symptoms of perforation and the operation was two hours (Case XX); the longest, nine days (Case XVI).

The operation was performed during the first 4 hours in 2 cases, 2 recoveries, 100 per cent recoveries; during the second 4 hours in 3 cases, 2 recoveries, 66.7 per cent. recoveries; during the third 4 hours in 7 cases, 5 recoveries, 71.4 per cent. recoveries; during the fourth 4 hours in 3 cases, 3 recoveries, 100 per cent. recoveries; during the fifth 4 hours in 1 case, 0 recoveries, 0 per cent. recoveries; during the sixth 4 hours in 1 case, 0 recoveries, 0 per cent. recoveries; later than first 24 hours in 7 cases, 4 recoveries, 57 per cent. recoveries; (?) in 1 case, 0 recoveries, 0 per cent. recoveries.

The Prognosis in Children.—While a statistical table of twenty-five cases is a small one from which to draw any sweeping conclusions, the above table does seem to indicate that very early operative interference offers the best chance for recovery. Two patients operated upon during the first four hours recovered. One patient, among three who were operated on during the second four hours after the first symptoms of perforation, recovered from the operation and from all of the abdominal symptoms, but died one week later from typhoid toxæmia (Case XXI). If this case be considered an operative recovery, then all five cases operated on during the first eight hours recovered, and of fifteen patients operated on within the first sixteen hours, thirteen, or 86.6 per cent., recovered. Of nine patients operated upon after the first sixteen hours had elapsed, only four, or 44.4 per cent., recovered.

Keen, Loison,[25] and others have made some allusion to the fact that after operative interference for typhoid perforation, the prognosis is more favorable in children than in adults, but comparative statistics have never yet been made. The operative reports of different surgeons show that children

recover more often than adults. Thus, Taylor [26] operated upon five patients,—four adults and one child,—and only the child recovered; Dalziel [27] operated on five adults and one child, and only the child recovered; Escher [28] operated upon two children and two adults, both children and one adult recovered. Among the 289 operations for typhoid perforation of the intestine collected by the writer, twenty-five were in children with sixteen, or 64 per cent., recoveries. The statistics are the following:

Total number of cases operated on, 289.

Total number of patients recovered, 75; 25.9 per cent.

Total number of patients died, 214; 74.1 per cent.

Total number of adults, 264; 91.4 per cent.

Total number of children, 25; 8.6 per cent.

Total number of adults recovered, 59; 22.4 per cent. of the adults.

Total number of adults died, 205; 77.6 per cent. of the adults.

Total number of children recovered, 16; 64.0 per cent. of the children.

Total number of children died, 9; 36.0 per cent. of the children.

Therefore, twenty-five, or 8.6 per cent. of the operations that have been performed, were in children, with a mortality of only 36 per cent., while 264, or 91.4 per cent. of the total number of operations, were done in adults with a mortality of 77.6 per cent. The chances of recovery are therefore more than twice as good in children as in adults.

These statistics show that the prognosis after operations for typhoid perforation in children is far better than has been believed heretofore. As good results as the above can surely never be obtained by medical treatment alone, or by delay in operative interference with the hope that or until the inflammatory process has become localized. The treatment of perforation of the intestine—no matter from what cause—will in all probability always retain its surgical character; and I doubt that perforation of the bowel in the course of typhoid fever will

be an exception to this rule. Surgically speaking, we believe with Cushing that the only positive contraindication to the operation is a moribund condition of the patient. Much depends upon an early diagnosis, and further improvement in operative results will surely follow advances in diagnostic methods.

Operation.—The most important point to be kept in mind in the consideration of the operative methods for typhoid perforation is that rapidity is necessary for successful results. Children bear operations upon the abdomen as well as, if not better than, adults, if the manipulations be not too much prolonged. Mauger [20] declares that a laparotomy for typhoid perforation should never take more time than thirty minutes, and that the operation should never be undertaken by any one who is not sure of his technique. Although some patients have recovered after operations which lasted for one hour or over, it is nevertheless true that every increase in the duration of the operation diminishes by considerable the chances of recovery of the patient. As an example of what some children with typhoid perforation are able to withstand, we might cite the case reported by Cushing (Case XIII) in which the patient was operated on three times within two weeks—twice for perforations and the third time for intestinal obstruction from adhesions—and recovered.

Regarding the technical details of the operation in children, little need be said, as the operative measures are the same as for adults. I believe, however, that a light chloroform anæsthesia is preferable to local anæsthesia in children. Aside from the difficulty of keeping children quiet during operations under local anæsthesia, my experience in other abdominal operations in children has led me to believe that in children there is less danger of shock after operations under chloroform than under local anæsthesia, no matter how much morphine the patient has received before the operation.

The abdominal incision should preferably be made along the outer border of the right rectus muscle (Kammerer) or through its fibres, as in most cases the lesion will be found on

the right side of the abdominal cavity. In children, the greater part of the peritoneal cavity can often be examined through this incision.

In children, the infiltration of the wall of the bowel around the perforation is seldom so extensive as to prevent the closure of the opening in the intestine by a double layer of Lembert sutures. These had best be passed in the long axis of the bowel, so that, when tied, they will cause a minimum amount of constriction of the intestinal lumen. If the perforation be so large or the infiltration of the wall of the bowel so extensive that simple suture is impossible, the best procedure will be an omentoplasty. A portion of the omentum is sewed over the opening in the bowel, and escape of intestinal contents thus prevented. Resection of the intestine should never be done if it can possibly be avoided; very few patients would bear the additional shock of an intestinal resection. Resection of the bowel for typhoid perforation has, however, once been performed in a child with recovery (Case II).

Escher [30] has recently recommended that the perforation in the bowel wall should not be sutured, but that the affected loop of intestine should be sewn to the edges of the incision in the abdominal wall and the bowel drained. Of four patients operated on by this method three recovered. Escher claims three advantages for his method: (1) the rapidity with which the operation can be done; (2) the prevention of paralytic ileus by drainage of the intestine; (3) favorable effect upon the peritonitis of drainage of the intestine. I do not believe that the first advantage claimed by Escher is of importance. The difference in the length of time that is required for the suture of a perforation and for the attachment of a loop of the bowel to the abdominal wall will in most cases be a very small one. The beneficial effects of drainage of the intestine upon paralytic ileus and peritonitis cannot, however, be denied. I believe that this method of treatment proposed by Escher merits serious consideration. It is well worthy of a trial in an appropriate case where the perforation is of large size and situ-

ated low down in the ileum, and where there is already present an advanced stage of peritonitis.

In the majority of cases (82.6 per cent., Loison[31]) there is only one perforation, but a careful search for other perforations should always be made. Monod and Vanverts[32] state that it is sufficient to examine the intestine for a distance of fifty centimetres above the location of the perforation, but at least three to four feet of the ileum and in some cases the ascending colon and appendix vermiformis should be examined.

Whether the peritoneal cavity should be washed out with saline solution or not is a question whose answer must be left to the individual operator, who will be guided by his own views on the subject of irrigation of the peritoneal cavity in diffuse peritonitis. My own experience in abdominal surgery in children has been that unless there is distinctly fæcal matter in the peritoneal cavity, the peritoneum will take care of itself and irrigation be unnecessary. Up to the present time very few reports of the bacteriological findings in peritonitis after typhoid perforation have been published, but it is highly probable that, from the clinical stand-point at least, the peritonitis does not differ essentially from the peritonitis that follows perforation of the bowel in other diseases. I prefer to sponge away as much as possible of the exudate with gauze sponges and to depend to a great extent upon the absorptive powers of the peritoneum. Where, however, there is fæcal matter in the abdominal cavity, irrigation with isotonic 0.9 per cent. saline solution is necessary. Great care should be taken to keep the intestines as much within the abdominal cavity as possible, for the shock of evisceration in children is very great.

Neither do I think there is any advantage in a wide drainage of the peritoneal cavity. It will generally suffice to pass a small strip of gauze or a cigarette drain down to the suture line in the intestine and then to close the greater part of the abdominal incision. In the large number of cases of perforative appendicitis with diffuse peritonitis that we see at Mount Sinai Hospital every year, we rarely attempt to drain the general peritoneal cavity widely, because we do not believe that

a wide drainage of the peritoneal cavity can often be accomplished. Within a few hours of the insertion of the drains the general cavity becomes walled off by adhesions around the drains. From the time that we stopped draining the peritoneal cavity widely, or rather making the attempt to do so, our results in peritonitis have become distinctly better (see Mount Sinai Hospital Reports, Vol. iii, report of the Second Surgical Division of Dr. Howard Lilienthal).

The after-treatment differs in no way from that after laparotomy for other conditions, with the exception that the general feeding must be that of a patient with typhoid fever.

Conclusions.

Although the writer is well aware of the fallibility of statistics,—successes being more often published than failures,—the chances of error are much less where comparative statistics are given. Although it is very probable that the mortality after laparotomy for typhoid perforation is somewhat greater than the statistics show, there is no reason to doubt that the prognosis in children is fairly good,—more than again as good as in adults.

The figures given in this paper refer to children between the ages of six and fifteen years, and not to younger children or infants in whom perforation is very rare, and in whom no operation for typhoid perforation of the intestine has been recorded in literature.

The advances in abdominal surgery have been so great since Mikulicz's first operation for perforation of the intestine, that the profession is to-day almost unanimous in the belief that the only treatment for perforation of the bowel in the course of typhoid fever—as soon as the diagnosis has been made—is a surgical one. It may be many years before we can hope for much improvement in the surgical methods of treatment of diffuse peritonitis. The operative results will, however, become better if the patients are referred to the surgeon more early. Improvement can therefore only come with improved methods of diagnosis. It is from this point of view

that efforts—such as that of Cushing and his suggestion of a preperforative stage—are of value. While we may not agree with Cushing as to the possibility of diagnosticating the condition correctly in any more than exceptional cases, the effort is certainly one in the right direction.

In this paper the attempt has been made to show

(1) That perforation of the intestine in the course of typhoid fever is very nearly as frequent in children between the ages of six and fifteen years as in adults.

(2) The symptoms do not differ essentially from those of adults.

(3) Although recovery may, in exceptional cases, take place without operation, the treatment should be a surgical one as soon as the diagnosis has been made.

(4) The prognosis after operation is more than twice as good in children as in adults, and very early operative interference offers the best chances for recovery.

TABLE OF CASES OF LAPAROTOMY FOR TYPHOID PERFORATION IN CHILDREN.

No.	Author.	Sex.	Age.	Main Symptoms.	Day of Disease.	From First Symptom to Operation.	Leucocytes.	Result.	Remarks.
1	Alexandroff[33]	M.	9	Sudden pain; vomiting; rapid pulse.	35th day.	20 hours.	.....	Death, ½ hour.	Chloroform anæsthesia; general purulent peritonitis.
2	W. Hill[34]	M.	13	.....	6th week.	12 hours.	.....	Recovery.	Large perforation; resection and Murphy-button anastomosis.
3	Brun[35]	M.	14	Sudden pain; early and continued vomiting; moderate distention; general tenderness and rigidity; rapid pulse; pinched face.	In relapse.	22 hours.	.....	Death, 7th day.	Perforation sutured; irrigation; at autopsy five other perforations; general peritonitis.
4	Léjars[36]	M.	11	Symptoms of peritonitis.	?	?	.....	Death.	.....
5	Hawkins and Thurston[37]	F.	11	Sudden pain, in attacks; general tenderness and rigidity; vomiting; no distention.	41st day.	15 hours.	.....	Recovery.	Irrigation; drainage; excision of perforation and suture; perforation in cæcal wall; seropurulent fluid.
6	Dalziel[38]	F.	13	....	4th week.	11 hours.	.....	Recovery.	Median incision; irrigation; drainage.
7	Finney[39]	M.	12	Sudden pain; distention; tenderness and rigidity; rapid pulse.	2d–3d week.	3 days.	.....	Death.	Abdominal cavity contained gas, pus, and fæces; suture of perforation; irrigation; drainage; entered hospital in extremis.
8	Martin[40]	M.	12	.....	3d week.	33 hours.	.....	Death, 16 hours post op.	General purulent peritonitis; suture of perforation; irrigation; drainage.
9	C. R. Russell[41] ...	M.	7	Gradual onset of pain and abdominal tenderness; no distention or rigidity; vomited once.	10th day.	12 hours.	28,000	Recovery.	....
10	Legueu[42]	?	10	Sudden pain in right iliac fossa, with rigidity and tenderness; small pulse.	15th day.	12 hours.	.....	Death.	....
11	Legueu[42]	M.	15	Sudden pain; collapse.	20th day.	6 hours.	.....	Recovery.	Large perforation; purulent fluid in cavity; omentoplasty; drainage.

TABLE OF CASES OF LAPAROTOMY FOR TYPHOID PERFORATION IN CHILDREN.—*Continued.*

No.	Author.	Sex.	Age.	Main Symptoms.	Day of Disease.	From First Symptom to Operation.	Leucocytes.	Result.	Remarks.
12	A. A. Berg [43]	M.	7	Sudden pain in right iliac region; chills, fever, vomiting; abdominal distention; tenderness, rigidity.	2d week.	22 hours.	.....	Recovery.	Ambulatory typhoid; diffuse peritonitis; suture of small perforation; no irrigation; drainage.
13	Cushing [44]	M.	9	Colicky abdominal pain, vomiting, rapid feeble pulse, high temperature, cyanosis, abdominal tenderness.	13th day.	4 hours.	16,000	Recovery.	Suture of perforation; seropurulent fluid in general peritoneal cavity; irrigation; drainage; fæcal fistula from second perforation. Twelve days later laparotomy for symptoms of perforation; none found. Two days later laparotomy for acute intestinal obstruction due to adhesions about another perfora'n.
14	Richards and Goodall [45]	F.	8	Very gradual onset, with abdominal pain and tenderness.	Relapse.	12 hours.	.....	Death in 4 days.	Perforation thirty inches from cæcum; suture, irrigation, drainage; autopsy showed another perforation.
15	Hugh M. Taylor [46]	M.	9	Sudden colicky pain, with abdominal tenderness and rigidity on right side; some vomiting; no distention.	Relapse.	15 hours.	.....	Recovery.	Seropurulent peritonitis; perforation sutured; irrigation; drainage.
16	Pearson [47].....	M.	14	Sudden abdominal pain, followed by symptoms of peritonitis.	16th day.	9 days.	.....	Recovery.	Abscess opened and drained.
17	W. L. Rodman [48].	F.	12	Sudden pain, followed by chill and collapse. Temp. dropped to 96.2° F. from 105°; later rose to 102°; marked distention and tenderness; repeated vomiting; anxious look.	5th week.	37 hours.	.....s	Recovery.	Intestines distended; perforation size of end of finger; suture; irrigation; drainage.

TABLE OF CASES OF LAPAROTOMY FOR TYPHOID PERFORATION IN CHILDREN.—*Continued.*

No.	Author.	Sex.	Age.	Main Symptoms.	Day of Disease.	From First Symptom to Operation.	Leucocytes.	Result.	Remarks.
18	Dandridge [49] . . .	M.	9	Sudden severe pain, with increasing distention and tenderness; obliteration of liver-dulness; pinched face; rapid, small pulse.	21st day.	3 days.	. . . . .	Recovery.	Gas and stinking pus in peritoneal cavity; irrigation; drainage.
19	Dandridge [49]	M.	10	Vomiting first symptom; abdominal distention and tenderness.	21st day.	28 hours.	. . . . .	Death.	Diffuse peritonitis; perforation one inch from cæcum; suture; irrigation; drainage.
20	McRae and Mitchell [15]	F.	8	Sudden pain; marked tenderness; some distention; marked rigidity; no vomiting; liver-dulness somewhat obliterated; rapid, weak pulse.	19th day.	8 hours.	11,500	Recovery.	Perforation ten centimetres from cæcum; omentoplasty; irrigation; drainage.
21	McRae and Mitchell [15]	M.	11	Sudden pain in paroxysms; later, distention, rigidity, tenderness; partial obliteration of liver-dulness.	30th day.	8 hours.	12,000	Death after one week.	Death due to toxæmia of the disease after all abdominal symptoms had disappeared.
22	Bowlby [50].	M.	10	Paroxysm of severe pain in abdomen, followed by sweating, abdominal rigidity; rapid and feeble pulse.	34th day.	2 hours.	. . . . .	Recovery.	Gas and fluid in cavity; intestines distended; perforation two feet from valve; no irrigation; suture of perforation; drainage.
23	Escher [51]	M.	13½	Sudden pain, followed by symptoms of general peritonitis.	4th week.	80 hours.	. . . . .	Recovery.	Perforation not found; fæcal fistula established.
24	Escher [51]	M.	8	Sudden fall of temp. to subnormal, with distention of abdomen, tenderness, vomiting.	3d week.	10 hours.	. . . . .	Recovery.	Perforations in lower part of ileum; diffuse purulent peritonitis; drainage of perforations; no suture.
25	Elsberg	F.	6½	Chill, followed by abdominal distention, tenderness, rigidity, pain; partial obliteration of liver-dulness; vomiting.	33d day.	16 hours.	18,000	Recovery.	Perforation twenty centimetres from valve; seropurulent peritonitis; perforation sutured; no irrigation; drainage.

CASES OF LAPAROTOMY FOR TYPHOID PERFORATION IN ADULTS FROM JANUARY, 1900, TO MARCH, 1903.

Woolsey, ANNALS OF SURGERY, 1900, p. 764, 1 death.
Jones, ANNALS OF SURGERY, Vol. xxxiv, p. 177, 1 recovery.
Cushing, ANNALS OF SURGERY, 1901, 1 recovery.
Russell, Boston Medical and Surgical Journal, Vol. cxliv, No. 16, 1 death.
Lower, Cleveland Medical Gazette, 1900, p. 321, 1 death.
Armstrong, Journal of the American Medical Association, May, 31, 1902, 25 deaths, 1 recovery.
Briggs, American Journal of the Medical Sciences, January, 1902, 4 deaths, 1 recovery.
Houchard, Bull. et Mém. de la Soc. Anat., April, 1899, 1 death.
Mayer, Pennsylvania Medical Journal, 1900, 1 recovery.
Dans, Presse Médicale, December, 1900, 1 recovery.
Legueu, Revue de Chirurgie, December, 1900, 1 recovery.
Warren, Transactions of the American Surgical Association, Vol. xviii, 1900, 19 deaths, 3 recoveries.
Loison, Revue de Chirurgie, xxiii, 1901, 1 recovery.
Legueu, Revue de Chirurgie, xxiii, 1901, 2 recoveries.
Rochard, Revue de Chirurgie, xxiii, 1901, 2 deaths.
Routier, Revue de Chirurgie, xxiii, 1901, 1 death.
Shoemaker, Medical News, April 12, 1902, 1 death.
Taylor, Dublin Journal of the Medical Sciences, January, 1901, 2 deaths.
Loison, Revue de Chirurgie, 1900, p. 179: Sieur, 1 death; Mignon, 1 death; Davis, 1 death.
Monod, Bull. de la Soc. de Chir., December, 1900, 1 death.
D'Audet, Arch. de Méd. Militaire, 1899, Vol. xxiv (see Loison), 2 deaths.
Platt, British Medical Journal, 1899, p. 1097, 2 deaths, 1 recovery.
Borrs, British Medical Journal, 1900, 1 death.
Balance, British Medical Journal, 1900, 1 death.
Deanesly, British Medical Journal, May 4, 1901, 1 recovery.
Heuston, British Medical Journal, November 16, 1901, 1 recovery.
Marsden, Lancet, June 23, 1900, 1 death.
Godwin, Lancet, August 17, 1901, 1 death.
Davis, American Medicine, January 18, 1902, 1 recovery.
Willard, ANNALS OF SURGERY, Vol. xxix, p. 503, 1 death.
Taylor, Virginia Semimonthly Medical, 1899, 4 deaths.
Dandridge, Cincinnati Lancet Clinic, 1901, 1 death.
J. C. Munro, Boston Medical and Surgical Journal, February 5, 1903, 14 deaths, 1 recovery.
Ferrier, Semaine Médicale, 1901, No. 7, 2 deaths, 1 recovery.
F. Tilden Brown, ANNALS OF SURGERY, March, 1903, 2 deaths, 1 recovery.
Escher, Grenzgebiet der Medicin und Chirurgie, Vol. xi, No. 1, 1 death, 1 recovery.
Hays, American Medicine, September 6, 1902, 4 deaths, 3 recoveries.
See also Therapeutische Monatshefte, November and December, 1902, for additional cases.

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[6] Handbuch der Kinderkrankheiten.
[7] Loc. cit.
[8] Loc. cit.
[9] Johns Hopkins Hospital Bulletin, 1898.
[10] Finney, loc. cit.
[11] Nothnagel's System, American Edition, Vol. i.
[12] Loc. cit.
[13] Johns Hopkins Hospital Reports, 1900.
[14] Johns Hopkins Hospital Bulletin, 1898; Johns Hopkins Hospital Reports, Vol. viii.; also ANNALS OF SURGERY, May, 1901.
[15] Johns Hopkins Hospital Reports, 1902, Vol. x, Nos. 6 to 9.
[16] Boston Medical and Surgical Journal, Vol. cxlii, No. 26, p. 627.
[17] Loc. cit.
[18] Practice of Medicine.
[19] Loc. cit.
[20] Loc. cit.
[21] Loc. cit.
[22] Medico-Chirurgical Transactions, Vol. lxxx, p. 127.
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DISLOCATION OF THE CARPAL SCAPHOID.

BY LEONARD W. ELY, M.D.,

OF NEW YORK.

DISLOCATION of the scaphoid bone of the wrist, without fracture, is a very rare injury. In his book on fractures and dislocations, Stimson gives only two authenticated cases. Fracture of the scaphoid, with dislocation, is also rare. According to the same writer, there are only five cases on record.*

The history of this case is as follows: On the 1st of February, 1903, an automobile in which the patient, a man of twenty-five, was riding, overturned, and, as far as could be learned, some part of it fell on his right wrist. The lesion was diagnosed as crushing of the tendons of the wrist, and hot applications were prescribed. These were continued for about twenty-four hours. When seen next morning for the first time, the wrist was swollen and infiltrated, and presented on its flexor aspect a number of abrasions, showing the nature of the violence—that is, direct. Motion or pressure caused pain. The case appeared to be a Colles's fracture, and the patient was told that he must take an anæsthetic and have it reduced. The operation was done that afternoon.

Under ether, crepitus could be distinctly perceived in the wrist, though its origin could not be exactly ascertained. By manipulation, the scaphoid could easily be dislocated on the dorsum of the wrist, and by pressure could be replaced. On this symptom the diagnosis was made. The skiagram taken at a later date shows a slight tipping forward of the scaphoid, and a chipping off of the styloid process of the ulna; but we shall remain in doubt whether the lesion was a simple dislocation of the scaphoid, or whether it was accompanied by a fracture of this or of one of the neighboring bones. The skiagram showed no such fracture, but the crepitus seemed to come from a point very near the scaphoid. The dislocation, however, was unmistakable.

* ANNALS OF SURGERY, vol. xxxv, p. 257.

The treatment was by anterior and posterior molded plaster-of-Paris splints, the posterior splint reaching to the end phalanges, the anterior to the metacarpophalangeal joints. At the end of one week the anterior splint was removed, and at the end of about three weeks the posterior splint was taken off, and adhesive tape was applied to the forearm and hand. This was left on for about two weeks, permitting some motion, but affording a certain amount of support.

The patient recovered with a good degree of motion in all directions.

In Stimson's two cases of fracture, he made his diagnosis sure by cutting down and excising the misplaced fragments. The displacement in our case was not sufficient to warrant this, and the wounds on the anterior surface, being mere abrasions, did not necessitate a cutting operation.

The injury is a rare one, but our experience leads us to think that it may occur without recognition. If we had not used an anæsthetic, the nature of the injury would probably have escaped us, for only when the muscles were completely relaxed by the ether could the scaphoid be moved about. Perhaps Colles's fracture bears some blame it does not deserve, and crushing of the tendons at the wrist might be thought to cause great disability and deformity.

[The writer acknowledges his indebtedness for assistance to Dr. William C. Clarke, who was the first to recognize the true nature of the injury.]

Dislocation of the carpal scaphoid.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, March 11, 1903.

The President, LUCIUS W. HOTCHKISS, M.D., in the Chair.

UNUNITED FRACTURE OF CLAVICLE TREATED BY SUTURE.

DR. ALEXANDER B. JOHNSON presented a young man of twenty-two years, who entered hospital September 8, 1901. About a year previous to that date he had received an injury to his right shoulder, for which no treatment had been sought. The shoulder became painful, and he could bear but little weight upon it. Examination revealed a fracture of the right clavicle near the middle with weak fibrous union, with marked overriding. The lower fragment was displaced backward and there was great disability. Upon exposing the fracture, it was found to be extremely difficult to approximate the two ends of the bone. In order to accomplish this, so much force was necessary that it was thought wiser to remove a small section of bone from each fragment. After the removal of these shelf-like sections, forming a mortise, the two fragments were approximated and sutured with heavy catgut. The patient remained in the hospital about three weeks. Good bony union was evidently secured, as there were no evidences of motility at the present time. The limb was useful and strong.

TORSION OF THE OMENTUM.

DR. JOSEPH A. BLAKE presented a man, forty-five years old, a book-keeper by occupation, who was admitted to Roosevelt Hospital January 5 of the present year with the following history.

He had had an inguinal hernia on the right side for twenty years, which had always been reducible, and for which he had worn a truss at times, but not continuously.

Three days before his admission he had had pain in the right side of the abdomen and in the hernia. Attempts at reduction were unsuccessful and attended with pain. The pain increased and was located chiefly in the epigastrium and right side of the abdomen. There was also nausea and some vomiting.

The condition on admission was as follows: Italian; short stature; obese; evidently suffering from severe pain; general condition fair; temperature, 101° F.; pulse, 100. Panniculus very thick. A large scrotal hernia on the right side, which was not tense, but extremely tender. A small part of the contents could be reduced, showing that the canal was not wholly occluded; the remainder was apparently irreducible omentum. The lower right quadrant of the abdomen seemed to be filled with a mass which reached to the middle line; the muscles were rigid and, on account of the thickness of the abdominal wall, the mass could not be defined.

As the patient was excitable and spoke only a little English, a reliable history could not be obtained at that time, and the true nature of his difficulty was not suspected.

A diagnosis of probable appendicitis with a peritonitis spreading into the hernial sac was made. An incision was accordingly made through the right rectus. The omentum was found directly beneath the wound and was completely gangrenous. Its bulk was not increased, so that the arterial supply must have been cut off as soon as the venous return. Its lower end entered the neck of the hernia and could not be withdrawn.

The abdomen contained a slight amount of bloody serum. A second incision was then made over the inguinal canal and the sac isolated and opened. It contained some bloody serum. Two fingers could be easily inserted alongside the omentum through the internal ring, showing that there was no constriction. The omentum was then pushed through into the abdomen with some difficulty. It was not adherent to the sac, but its extremity was thickened.

The omentum could then be brought out of the abdominal wound, and it was found twisted through four and a half turns at its attachment to the transverse colon, constricting it to a rope-like mass one and one-quarter inches in thickness and four inches long.

The entire gangrenous portion was removed, and when spread

out measured twenty-three inches in length and fourteen in breadth. It weighed two pounds and twelve ounces.

The abdominal cavity was washed out, the wound closed, and a radical operation performed on the hernia. No drainage was employed.

The wounds healed *per primam,* and the patient was discharged in three weeks.

The mechanism in this case differs to a certain extent from that in the reported cases.

The sequence of events was probably as follows. The circulation of the omentum in the sac became temporarily obstructed, rendering it irreducible. The attempts at reduction probably started the torsion, which was then carried on by repeated attempts at reduction or by the muscular action at the ring.

In all but one of the cases collected by Wiener, who published them with one of his own in the ANNALS OF SURGERY of November, 1900, the tip of the omentum was adherent, causing a more or less sling-like arrangement. In this case the end was not adherent, but was retained in the hernial sac.

Wiener, in a very careful search, was only able to find seven cases, including his own.

In all cases a hernia was present, but the omentum was not always found in relation with the hernia.

In none of the cases was so much of the omentum involved as in this case.

DR. CHARLES H. PECK said he had seen a similar case four years ago. The patient was a woman, thirty-seven years old, who, when she entered the hospital, gave an acute history of about one week's duration. She had a slight temperature, less than 102° F.; there was some abdominal pain, and the entire lower abdomen, especially on the right side, was distinctly rigid. Through the vagina a bulging mass could be felt behind the cervix. The case was regarded as one of suppurating cyst, but, upon attempting to evacuate it through the posterior fornix, it proved to be a solid mass. That wound was thereupon packed, and upon opening the abdomen an omental torsion was found which filled the entire lower abdomen. The pedicle was quite large, about the same size as that in the case reported by Dr. Blake. The omentum was in a gangrenous condition. The entire mass was removed without much difficulty, as the adhesions were very recent, and the patient

made an uneventful recovery. She gave a history of a right inguinal hernia of twelve years' duration, for which she had never worn a truss, and which had never before given her any trouble.

INTESTINAL OBSTRUCTION.

Dr. Willy Meyer presented a woman, thirty-eight years old, who, when she came under his observation, September 26, 1902, stated that four weeks before she had a sudden abdominal pain in the left inguinal region. This improved under treatment. A week later she had another attack of intense pain in the same region, and from that time on she complained of intermittent, loud, gurgling abdominal sounds day and night. Her appetite had been good; there had been no vomiting. The last movement of the bowels had been four days before; since then there had been absolute obstruction.

When Dr. Meyer first saw the patient she was up and about and suffering no pain. Her pulse was 96; temperature normal. Fæcal vomiting had set in that morning. The abdomen was tympanitic, and the loud, gurgling sounds referred to above were heard once in the course of the examination. Upon auscultation, peristaltic noise was audible. There was slight, generalized tenderness over the entire abdomen. In the posterior lip of the cervix a hard, irregular nodule was felt, which had been diagnosed by her attending physician as a myoma. Malignancy of this tumor was suspected.

Immediate operation at the German Hospital September 26, 1902. After previous lavage of the stomach and thoroughly cleansing the vagina, a median abdominal incision was made. Through this a large quantity of serous fluid escaped. Both the small and large intestines were immensely distended; they were rapidly eviscerated, and the incision was lengthened to a point midway between the umbilicus and xiphoid. At the junction of the sigmoid and rectum a cancerous mass was found tightly constricting the gut. Both ovaries and tubes were also involved in the shape of large tumors; and upon removing these it was seen that the whole lower portion of the rectum, as well as the peritoneum of the small pelvis, was studded with carcinomatous deposits. The trouble was so extensive that only a palliative operation was deemed justifiable. This consisted of an inguinal colostomy, with a spur formation, which was done through the usual

incision. The gut having been sutured in place, an attempt was made to replace the intestines within the peritoneal cavity; they had been out for nearly an hour, and were black and blue. As reduction was impossible, a transverse incision was made into a knuckle of small intestine, and through this a large amount of foul-smelling fæcal matter escaped. She had also vomited considerable fæcal matter during the course of the operation. As she had been kept in Trendelenburg's posture, aspiration was avoided. After emptying the intestines, it was a comparatively easy matter to replace them, with the help of "Kümmel's serviette." At this juncture the patient was given an intravenous infusion. Now the upper and lower ends of the wound were stitched, the rest left open with secondary sutures in place. The spur was then incised transversely, just long enough to admit a large drainage tube, and the patient was put to bed.

There was free drainage from the partially open abdominal wound, and on October 1, five days after the primary operation, the patient was again put under a general anæsthetic, and the abdominal wound was closed. A further transverse slit was also made in the artificial anus, and the borders of the sigmoid were stitched to the skin by silkworm-gut sutures. In the following night the patient became seriously sick, her temperature rising to over 106° F., pulse to 160. With careful nursing she pulled through.

With the exception of the development of a bed-sore over the sacral region, which appeared within a few hours and went soon to the bone, the patient made a good recovery from the operation, and since then she has gained over twenty-five pounds in weight. A microscopical examination of the growth confirmed the diagnosis of carcinoma.

Dr. Meyer said that in cases of incomplete intestinal obstruction of long standing, with great distention of the abdomen (obstructive ileus) in old people, he was strongly in favor of a primary colostomy. If possible, he would in such cases henceforth use the appendix, after the method suggested by Dr. Weir, for the purpose of emptying the distended intestines, provided the organ proved to have sufficient caliber. Such operation (intermuscular) could be well done under local cocaine anæsthesia.

Dr. George Woolsey said he did not think it would always prove feasible to employ the appendix for the purpose mentioned by Dr. Meyer. In old people, especially, there was a tendency

for the appendix to atrophy, and in 50 per cent. of cases over sixty years its lumen was partly obliterated, so that it was doubtful whether its lumen would be large enough to serve as an outlet for the fæces.

Dr. Meyer, in reply to Dr. Woolsey, said that in old patients, who were in no condition to bear a prolonged operation or a general anæsthetic, it might be worth the trial to empty the distended intestines through the appendix. That operation was comparatively simple, and could be done under a local anæsthetic. The distended gut was opened after the abdominal cavity had been closed. Even if the lumen of the appendix was somewhat small, it might afford an exit for the thin contents of the gut.

CICATRICIAL STRICTURE OF THE ŒSOPHAGUS (ABBE'S STRING METHOD).

Dr. Meyer presented a boy, five years old, who, in March, 1901, drank caustic lye from a bottle. As a result of this, he subsequently developed two strictures of the œsophagus,—the one five and the other nine and one-half inches from the teeth. At first, small-sized bougies could be introduced into the stomach, but, because of an intercurrent attack of tonsillitis, the treatment had to be discontinued; and upon his recovery it was found that not even the smallest-sized instrument would pass the obstructions. A gastrostomy (Kader) was thereupon done at the German Hospital, and about a month later a small filiform bougie could again be introduced from above. Repeated attempts were then made, with the aid of the cystoscope and various curved and straight forceps, to locate and grasp the lower end of the bougie through the gastrostomy wound, but these proved fruitless until the stomach had been filled with fluid. It was then easily caught with the forceps, and a piece of stout fish-line attached, which was drawn upward through the mouth. A few days later, by the sawing method described by Dr. Abbe, the two strictures were gradually divided until a No. 35 French bougie could be passed without difficulty. The instruments devised by Dr. Theodore Dunham were used with great success, the doctor himself kindly aiding at the operation. One week later the manœuvre was repeated. Since then the caliber of the œsophagus has been maintained by means of Dunham's instruments. The gastrostomy wound was

allowed to close. The little patient is now in excellent condition, eats what he wants, and swallows without any difficulty. He has materially gained in weight.

DR. BLAKE said that about two years ago he employed Dr. Dunham's method in a case of impervious stricture of the œsophagus in an adult. In that instance, no instrument could be made to pass the point of stricture, but by the thread-swallowing method, as demonstrated by Dr. Dunham at a meeting of the Surgical Society about a year ago, the result of the treatment was highly satisfactory.

DR. WOOLSEY said that the result of dividing an œsophageal stricture by the Abbe string-saw method was usually successful and devoid of danger. In a paper read in 1894 (ANNALS OF SURGERY, March, 1895) he collected twenty-eight cases of operation for cicatricial œsophageal stricture without a death. About a year ago he operated by this method upon a patient who was an alcoholic subject, and in whom the stricture was very low down, near the cardia. Through the opening in the stomach the œsophageal orifice could not be felt or found, but a small bougie introduced from above gradually worked its way into the stomach, but its point of entrance did not feel like an orifice of the stomach on account of the cicatricial contraction. The stricture was divided by means of the string-saw until full sized bougies could be passed from above. After this the opening into the stomach was treated by the method of Kader for feeding purposes, and a silk ligature was brought out through this and through the mouth, in case any recontraction occurred or any difficulty in passing bougies. He made a good recovery, and after an interval of five days bougies were easily passed from above into the stomach on two occasions. The patient died rather suddenly ten days after the operation, and the autopsy showed an area of gangrene surrounding the gastrostomy wound in the stomach.

DR. MEYER said it was rather surprising that these operations within the œsophagus by means of the string did not prove more troublesome than experience had shown them to be. This was probably due to the superficial character of the wound made by the string. The speaker said that in a case of internal œsophagotomy which he reported to the Society fifteen years ago, the operation was followed by acute meningitis and death. Dr. Meyer highly recommended Dr. Abbe's ingenious method of introducing

an instrument through the stricture, and using the string and its subsequent dilatation with the help of Dr. Dunham's instruments. After one or two sittings, the stricture is sufficiently dilated to permit the gastric fistula to heal.

CYSTOCELE COMPLICATING INGUINAL HERNIA.

Dr. Otto G. T. Kiliani presented two young men who had recently been operated on at the German Hospital, one by Dr. Kammerer and the other by Dr. Kiliani Both had been regarded as cases of simple inguinal hernia, and, as there had been no bladder symptoms, the cystocele was an unexpected complication. The section of bladder involved was extraperitoneal, and in both instances presented itself as a typical lipoma. In both cases the bladder was recognized, and an injury avoided.

As to the frequency of this complication, Dr. Kiliani said it existed, according to one author, in 1 to 3 per cent. of all cases of inguinal hernia, while another writer had put the figures as high as 30 per cent. The latter (W. Becker, of Braun's Clinic) probably had met with it so frequently because he only operated on cases of very large hernia.

Dr. John B. Walker said he had seen three cases of hernia of the bladder in adults, but in none of them was there a distinct lipoma: there was merely an increase in the fat.

TUBERCULOSIS OF THE WRIST-JOINT TREATED BY BIER'S METHOD.

Dr. Willy Meyer presented a man, forty-two years old, who came under observation a year ago. He had tuberculosis of the left wrist, all the tendon sheaths being involved. As the patient's general condition was very poor and functional result of wrist-joint resection at his age rarely good, the conservative plan of treatment by Bier's method was decided upon instead of operative interference. The patient was informed that the treatment would take many months. An elastic bandage was applied to the arm above the wrist, the object being to keep the parts in a continuous condition of venous hyperæmia. Twice daily the bandage was removed and the arm was massaged. It was then applied at another place. After the first week's treatment the pain at night, which had given the patient much annoyance, had disappeared.

The treatment was kept up faithfully, but had to be interrupted for a time on account of the development of an abscess at the wrist, which was aspirated and injected with an emulsion of iodoform. After six months the bandage was applied only at night. The treatment has resulted in an entire cure, and Dr. Meyer thought that this method of Bier should be more frequently resorted to in tuberculosis of the joints of the extremities.

Dr. George R. Fowler said it had always been a source of wonder to him that the Bier method had not found more advocates, particularly among orthopædic surgeons, who probably see many more cases of tuberculosis of the joints than do the general surgeons. Many years ago Laënnec called attention to the fact that pulmonary tuberculosis was rarely associated with certain forms of cardiac disease, and this immunity he attributed to the stasis of the blood in the lungs resulting from the cardiac lesion. The same principle is applied in Bier's method, which produces a venous hyperæmia in the region of the diseased joint. Dr. Fowler said he had employed it in tuberculosis of the wrist, elbow, knee, and ankle, and, while his results had never been as brilliant as in the case shown by Dr. Meyer, decided improvement had always taken place. The great drawback was that, on account of the long duration of the treatment, patients were very apt to grow careless or abandon it entirely. The usual treatment of these cases by means of a fixation bandage of plaster-of-Paris produced a certain amount of stasis, and the good results obtained were possibly attributable in some degree to that fact.

Dr. Kiliani said that the original idea of Laënnec, to whom Dr. Fowler had referred, was that pulmonary tuberculosis did not occur in severe cases of scoliosis, where the entire pulmonary system was in a state of stasis.

Dr. Kiliani said that Bier's method of treating tubercular joints certainly gave good results, and should be used more than it is. Some years ago he showed six cases at a meeting of the German Medical Society treated by this method. In two of the cases the wrists were affected. The best results were obtained in comparatively young patients.

Dr. Willy Meyer, in closing, said he had first resorted to the Bier method in 1893. Eight years ago, at a meeting of the Orthopædic Section of the New York Academy of Medicine, he showed a case of tuberculosis of the elbow-joint in a man of fifty

that had been entirely cured by this method. He had also successfully treated a number of cases of tuberculosis of the wrists and knees by this same method. One great advantage of the treatment was that the patients did not have to remain in the hospital, but could be treated at home or at the dispensary.

THE TOXICITY OF APPENDICITIS, WITH REPORT OF A CASE OF "VOMITO NEGRO."

Dr. George R. Fowler read a paper with the above title.

Dr. Woolsey said that the only examples of black vomit he had ever seen were in cases of fatal diffuse septic peritonitis. The matter vomited in those cases was quite watery in consistency, dark-brownish in color, and its sediment, upon examination, proved to contain blood or blood pigment. The peritonitis in the cases he had in mind did not result from appendicitis, except in a single instance.

Dr. John F. Erdmann said he had never had a case of "black vomit" in which its occurrence could be ascribed to appendicitis alone, but within the last fourteen months he had seen two cases where it occurred after operations on the appendix and gall-bladder, done at the same time. In the second case, which occurred very recently, the bloody vomiting commenced immediately after the man left the operating table, and continued without cessation for two and one-half days, when death occurred. The vomiting was not expulsive in character. In the other case, which occurred about a year ago, the train of symptoms was practically the same, excepting that the vomitus became bilious in character on the second day.

Dr. Willy Meyer said he had seen a number of cases of "black vomit" following acute appendicitis, probably eight or ten in all; but he had not reported them because he had never succeeded in getting an autopsy. In all the cases the complication followed acute appendicitis, with septic peritonitis. It was his impression that this kind of vomiting was oftener met with in cases of peritoneal sepsis rather than of septic peritonitis. The coils of intestines were highly injected, dry, and sometimes the intestines were covered with a fibrinous exudate. In the majority of the cases the patients died. Lavage of the stomach did not affect the vomiting. In one case of acute gangrenous appendicitis,

without perforation, which he operated on last summer, black vomiting set in on the third day; that patient recovered with stomach lavage. Dr. Meyer said he had always had the impression that the "black vomit" was more apt to occur in cases of acute appendicitis in which operation was unduly delayed. He thought the possibility of its occurrence was another argument in favor of early operation in acute appendicitis. The speaker said Kehr, of Halberstadt, had seen many instances where the "black vomit" followed an operation for acute cholelithiasis. He agreed with Dr. Fowler and other authors that it was due to ulceration of the gastric wall in consequence of septic infection.

Dr. Kiliani recalled two cases of appendicitis, both in young girls, where the operation was followed by a low, septic temperature. Black vomiting set in on the fourth and fifth day, respectively, and both cases terminated fatally. The vomitus contained blood.

Dr. Blake said he thought that perhaps the occurrence of "black vomit" could be ascribed to general septicæmia and cellular degeneration. It was very likely that the gastric juice had a selective action upon the tissues of the stomach wall after the latter became devitalized. He did not believe that the condition was always due to a septic embolism.

Dr. Fowler, in closing, said that in the cases reported by Dr. Erdmann, where the "black vomit" set in almost immediately after operation, it might have been due to some punctate hæmorrhages, attributable to forcible emesis incident to the ether, rather than to septic embolism or as the result of the effects of toxic products upon the gastric mucosa. It was certain that one might get "black vomit" without the presence of appendicitis, peritonitis, or strangulated hernia. The phenomenon had been observed in various fevers and in severe malarial infection. Still, this did not alter the fact that in the type he had described the vomiting was evidently due to the toxic effects of the bacteria or their products originating from the diseased appendix. Even mild attacks of appendicitis might be accompanied by a moderately severe thrombophlebitis of the veins of the mesentery, and the infection might be carried in this way into the portal and pulmonary circulation, or even into the lumbar veins. While the occurrence of this type of vomiting was not necessarily confined to extremely virulent cases of appendicitis, it was usually limited to such cases,

and, as they were more apt to give rise to peritonitis than the mild cases, "black vomit" was naturally seen most frequently in the presence of peritonitis. The condition of dry peritonitis, referred to by Dr. Meyer, might be present, without any exudate, and still there be sufficient infection present to produce "black vomit." The suggestion made by Dr. Meyer to operate early was very important; yet in one of the speaker's cases in which the "black vomit" occurred the operation was done within twenty-four hours after the onset of the symptoms. In appendicitis it was sometimes difficult to decide whether we were operating early or late until the abdomen was opened.

THROMBOSIS OF THE SUPERIOR AND INFERIOR MESENTERIC ARTERY.

Dr. Otto Kiliani described the following case. The patient was a man who was admitted to the medical ward of the German Hospital on February 20, 1903, with the following history:

Twelve days ago pain in right hypochondriac region and diarrhœa. On the first day, twelve movements. This diarrhœa lasted four to five days, having from ten to twelve stools every day. After this the patient became constipated and was compelled to take laxatives. The pain in the abdomen was continuous, at times quite severe; colicky pains. Abdomen tense, hard, and very tender. Never noticed any blood in stools. Heart action irregular, first sound at apex indistinct. Diazo and Widal negative. February 23 he was transferred to the surgical side with marked peritonitis. Operation showed a large part of the ileum gangrenous; one small perforation in ileum was found. No strangulation, invagination, internal hernia, volvulus, or obturation found. Mesenteries thickened and inflamed. No pulse could be felt in the larger branches of the mesenteric arteries. Diagnosis of thrombosis of the mesenteric arteries was made, and, as the lesion was too extensive to warrant any operation on the gut itself, abdomen was closed. Death a few hours after operation. Post-mortem showed the upper eight feet six inches of intestines in fairly healthy condition; the other portion, consisting of lower part of jejunum and entire ileum, down to ileocæcal valve, gangrenous. Length of gangrenous gut, ten feet six inches. Mesentery gangrenous. Vessels collapsed distally, thrombotic at proximal ends. Thrombi found at junction of branches to superior mesenteric.

Both kidneys show pale infarct, sharply defined, of the size 1½ x 1¾ x 1¼ inches in the right, 1¾ x 1¾ x 1 inches in the left kidney.

Heart: valves fairly good, muscle shows interstitial changes. In left ventricle dark red blood-clot, attached to cordæ tendineæ.

Aorta: from arch to bifurcation atheromatous placques. Superior mesenteric itself patent, but its branches occluded by bright red clots. Inferior mesenteric shows bright red clot at its branching from the aorta three-sixteenths of an inch in diameter. Right common iliac normal, but that bifurcation shows well-formed clot.

Koelbing (Bruns's *Beiträge,* Vol. xxxiii, 1902) has collected forty-nine cases in literature of arterial thrombosis, and fifteen cases of thrombosis of the veins. No operated case had been diagnosed rightly. Two cases operated with favorable results, one by Elliot. Mistaken diagnosis, forty-eight inches resected. Second case, Lindner (Koelbing), resection of fifty centimetres of gut.

Dr. Woolsey said that a year ago last summer he saw a woman between thirty and forty years of age with symptoms of septic peritonitis. There was no suspicion as to the cause of the peritonitis. Upon opening the abdomen, he found that the intestines were bluish-green in color, and there was a brownish, watery fluid in the peritoneal cavity. The condition of the appendix, liver, gall-bladder, and pancreas was investigated, and found to be normal. The patient died within twenty-four hours, and the autopsy showed an embolism of the superior mesenteric artery. Almost the entire small intestine and a part of the large were gangrenous.

Stated Meeting, March 25, 1903.

The President, Lucius W. Hotchkiss, M.D., in the Chair.

RECURRENT ENDOTHELIOMA OF THE PAROTID GLAND.

Dr. George Woolsey presented a young man who was operated on by Dr. Woolsey in May, 1900. The history he gave at that time was that two and one-half years previous to that date

(in 1897) he had been operated on in San Francisco for a tumor involving the left parotid gland, which had been pronounced an endothelioma. At the time of the primary operation the tumor was not very large, but had been growing for about two years. After the first operation, the wound had never healed entirely; a sinus persisted, which had been scraped at the New York Hospital. Various other methods of treatment had also been resorted to, and when Dr. Woolsey first saw the patient, liquid air was being tried upon the wound as a caustic.

An examination revealed a swelling which involved the whole left parotid region and extended down below the angle of the jaw. There was an open sinus below the lobe of the ear which could be traced forward towards the angle of the jaw. The tumor was very hard; it apparently involved the entire gland, but had not spread outside the capsule of the gland. Its removal was attended with the usual difficulty in such cases, and necessitated the ligation of the external carotid artery and the temporomaxillary vein. The facial nerve, which was embedded in the tumor, was divided, and, as a result of this, the man now had a left facial paralysis. Otherwise, his recovery was uneventful. Winking in the left eye is confined to the lowering of the upper lid, probably from gravity; the lower lid cannot be raised. The patient has never had any trouble from the collection of food in the mouth, the dribbling of saliva, and but little from lachrymation and the resulting epiphora. He shows how little trouble a complete facial paralysis may cause a patient.

The tumor was sent to Dr. Ewing, and he pronounced it an endothelioma, a variety of growth which is not uncommon in this region. It was similar to the type of growth described by von Volkmann, rather than to those commonly seen here. Its structure was very much like that of carcinoma, but it was usually less malignant and rarely recurred. In this case the second operation was done almost three years ago, and there are no signs of a recurrence. The wound closed readily after the operation, and has remained so.

Dr. Charles L. Gibson said that over three years ago he saw a recurrent growth involving practically the whole parotid gland, which he removed *in toto*. The tumor had been subjected to a number of pathological examinations, and had been pronounced an endothelioma. There had been no recurrence since

the second operation, and it was rather strange that it should have recurred after the original one. In striking contrast with this case was one of endothelioma of the submaxillary gland, where removal was followed by a prompt and diffuse recurrence, involving the soft parts of the neck and jaw and causing death within six or eight months by metastatic involvement of the spinal cord. Endothelioma in other than glandular regions of the body usually remains localized, and does not show any tendency to malignancy.

Dr. Woolsey said that in the case he had shown it was possible that recurrence was due to the fact that the entire tumor had not been removed at the original operation. He had some reason to suspect this because of the fact that the wound had never healed after the first operation.

PLASTIC OPERATION AFTER EXCISION OF EPITHELIOMA OF THE CHEEK.

Dr. Charles H. Peck presented a man, forty-nine years old, who was operated on seven months ago for the removal of an extensive epithelioma involving the left cheek and angle of the mouth. The growth had existed about a year, and had invaded the tissues to such an extent that the results of the excision were not regarded as very promising.

In order to close the large gap left after removal of the growth, a flap was taken from the corresponding side of the neck and carried upward, so that it now formed a part of the left cheek and the angle of the mouth. The flap was not everted, as was usually done in these plastic operations. Its inner surface, which now forms part of the oral cavity, was allowed to heal by granulation. There had been very little shrinkage in the size of the flap, and the cosmetic effect of the operation was excellent. Thus far there were no evidences of a recurrence of the epithelioma.

The dimensions of the portion of cheek removed were, length, two and one-eighth inches; width, one and three-eighths inches; thickness (greatest), seven-eighths of an inch.

Dr. Howard Lilienthal asked Dr. Peck how the development of the epithelium on the inner surface of the flap progressed? He thought it would be interesting to note, in such a case, whether the process was analogous to that described by Dr. Otis in the

healing of strictures of the urethra after urethrotomy, where the defect is covered with epithelium of normal mucous membrane, and not with cicatricial tissue. In Dr. Peck's case, the inside of the cheek has the peculiar appearance of normal mucous membrane.

Dr. Peck said the color of the inner surface of the flap was rather more natural now than it was during the first few weeks following the operation. So far as he could follow the healing process, it was of the nature of the development of normal mucous membrane rather than true cicatricial tissue.

Dr. F. Kammerer said that he had never applied such a method for the correction of defects of the cheek, because he had always feared contraction during healing of the raw surface on the inside of the flap. The results after flap operations for the correction of defects of the lower lip, according to Volkmann's method, are not always very encouraging from a cosmetic point of view. He further mentioned a case in which he had removed the entire cheek for carcinoma, substituting therefor a large flap from the frontal region with its base at the zygoma. The flap was turned, bringing its external surface to the inside of the mouth and leaving the raw surface to be closed later by transplantation, according to Thiersch. After ten days the pedicle was divided, the flap retained its vitality throughout, but contracted rapidly. Unfortunately, an early recurrence interfered with the final result. No doubt the plan which had been recently suggested of immediate transplantation of epithelium upon the raw surface of the flap was the better one.

Dr. Hotchkiss said that some years ago he did a similar operation upon a patient at the Skin and Cancer Hospital, who had had an epithelioma of the lower lip removed, leaving a defect of the angle of the mouth. In that case the flap was taken from the neck, as Dr. Peck had done. The immediate result of the operation was excellent, but the patient was lost sight of soon after his discharge from the hospital, and he did not know how the case eventually turned out. Dr. Hotchkiss said that, in mapping out these flaps, allowance should always be made for a certain amount of contraction. The method employed by Dr. Peck was certainly simpler than turning in the skin surface of the flap and covering the raw outer surface with skin grafts. The formation of new mucous membrane in the case exhibited demonstrated that the simpler operation might be equally effectual.

SARCOMA OF THE SCAPULA.

Dr. Howard Lilienthal presented a girl of seventeen who was admitted to Mount Sinai Hospital October 16, 1902. Her family history was negative, and her previous history contained nothing of interest. One week before her admission she had first noticed, and then by chance, a lump over the right shoulder-blade. It was painless and had caused no disability. It had not apparently increased in size since it was first observed, and, according to the patient's statement, it had not caused any impairment of her health or strength.

Upon examination, the patient was found to be fairly well nourished. No glands could be felt excepting the left inguinal, which were slightly enlarged. There was an inconstant musical murmur of the heart, heard over the third left cartilage. An examination of the other organs proved negative.

In the right scapular region was a rounded mass, confined to the lower and outer two-thirds of the infraspinous fossa, and not involving the posterior border of the scapula. The mass was about the size of a large orange, smooth and elastic, but firm. The skin covering it was movable and normal in appearance. There were no dilated blood-vessels over it. The anterior border of the scapula was free, and the growth did not encroach upon any of the adjacent tissues. The axillary glands were not enlarged.

Two days after the girl's admission, a small section of the growth was removed and submitted to Dr. F. S. Mandlebaum, the pathologist of the hospital, who reported that it was a small, round-cell sarcoma. Three days later the patient had a chill, and her temperature rose to 102° F. The mass was evidently increasing in size, and the small wound through which a section had been removed looked red and inflamed. On October 24, the temperature had dropped to 99.8° F. On the 26th, two minims of Parke, Davis & Co.'s preparation of Coley's fluid were injected into the tumor; no reaction. On the 27th, four minims were injected; no reaction. On the 28th, six minims were injected, and on the following day the temperature rose to 102.8° F.; there was an area of redness about the wound, and the skin was slightly elevated. At this time the tumor measured thirteen centimetres in each diameter. On the 30th the temperature had fallen to 99° F. and the redness about the wound had decreased. On the 31st, twenty minims of Coley's fluid were injected, and on November 1, twenty-five minims. There was no reaction, but the mass

was perceptibly smaller. The size of the injections was daily increased until the dose had reached fifty minims. Some of these injections were followed by a slight chill, while others caused little or no reaction. On December 8 one minim of Buxton's preparation was injected: this was followed by a rapid rise of temperature from 98.8° to 104.4° F., with an accompanying chill. The same dose was repeated every day for three or four days, with very slight reaction. During this entire period of treatment, the patient was also subjected to daily exposure to the X-rays, each sitting lasting from ten to fifteen minutes. On December 13, there was considerable tenderness and swelling at the site of the injection: this disappeared under the application of an ice-bag. On December 25 it was noticed that the spine of the scapula had become more easily palpable. On January 3, of the present year, Parke, Davis & Co.'s fluid was substituted for the Buxton preparation, fifty minims being injected daily. The tumor continued to decrease in size, and on January 29 the injections were discontinued.

Dr. Lilienthal said that the improvement steadily continued, and at the present time the tumor can no longer be felt. A cutaneous thickening, however, still persists, which is apparently due to the use of the X-rays. The patient steadily improved in weight, and was discharged from the hospital February 8. The speaker said that his reason for not operating in this case was that an operation would have necessitated the complete removal of the scapula. On that account he determined to give Coley's fluid and the X-rays a brief, preliminary trial. If no improvement had occurred within a very short time, he would have resorted to operation.

CORTICAL BRAIN ABSCESS.

Dr. Hotchkiss presented a man, twenty-one years old, who was admitted to the hospital on November 6, 1902. He had been struck on the head by a falling rock, which produced a simple fracture of the skull on the right side, with the subsequent development of a large hæmatoma. On admission, the patient was stupid and but partially conscious; the pupils were equal. The stupor gradually became more pronounced, and on November 17, Dr. Hanscom, the house surgeon, under the supervision of Dr. Le Boutellier, made a large horseshoe-shaped incision through the scalp, and found a non-depressed, comminuted fracture of the skull. The skull was trephined, and an irregular section of bone,

about three inches by two inches, which was found loose in the centre of this fracture, was removed. There were several fissures which extended to the base of the skull. There was a small extradural and a very large intradural clot, and upon washing these out, a laceration in the cortex of the brain was discovered. The wound was closed, with drainage, and, with the exception of the development of a hernia cerebri, the patient apparently made an uneventful recovery, and was discharged December 7, 1902.

He was readmitted to the hospital on February 8, 1903, complaining of severe headache, dizziness, and pain in the skull. There was a diffuse cellulitis over the right side of the scalp and forehead, involving the right eye. After evacuating some pus from the superficial abscess, a large fluctuating tumor could be made out, apparently within the skull and over the site of the original injury. The large, horseshoe flap which had been made at the time of the original operation was again laid back, and a large abscess in the cortex was opened and drained. The abscess was situated very close to the motor area, but it had given rise to no motor symptoms. This was probably due to the fact that pressure upon the brain had been relieved by the large opening that had been left in the skull. After the second operation, a hernia cerebri again developed, which had to be cut off at various times. The patient's further recovery was uneventful.

Dr. Hotchkiss said the case showed the possibility of late cortical infection, even after the external wound has apparently healed.

Dr. Otto G. T. Kiliani said that at a recent meeting of the Society he had shown a patient upon whom he had operated for tumor of the brain. An extensive cavity was left after removal of the tumor, which was temporarily tamponed with iodoform gauze, and when the gauze was taken out the bone-flap could not be accurately approximated to the gap left in the skull. On account of this displacement, a slight bony necrosis resulted and a small fistula developed. The patient continued to improve, and finally insisted on going home. Four days after his departure from the hospital he suddenly died. An autopsy showed that the cause of his death was meningitis, traceable to this small fistula, which had persisted for two and one-half months.

Dr. Woolsey said the following case was of interest, as bearing upon the possibility of late suppuration after injuries of the skull. The patient was a butcher, who, while entering a cold-

storage place, ran his head against a meat-hook. This produced a scalp-wound of the right frontal region, which was thought nothing of; it rapidly healed, and apparently gave him no further trouble. Six years later he came to the hospital, presenting a large, red swelling of the scalp over the site of his previous injury. After opening this abscess and evacuating the pus, a probe was introduced, which imparted the sensation of an ordinary compound depressed fracture of the skull. Dr. Woolsey operated and found such a fracture, which had healed. There was an abscess between the scalp and the bone, and another underneath the skull, between the bone and the dura (epidural). The bone was somewhat eroded but not necrotic.

A CONTRIBUTION TO THE RADICAL CURE OF LARGE UMBILICAL HERNIA.

Dr. Forbes Hawkes read a paper with the above title.

Dr. Lilienthal said the specimen shown by Dr. Hawkes in connection with his paper clearly demonstrated the intimate way in which the fibrous tissue invaded the interstices of the silver netting. The speaker said he had never resorted to the use of silver filigree in the closure of these large ventral herniæ, having always been somewhat timid about the introduction of a foreign body in this region. In one instance he succeeded in closing a large gap in the median line, which could not be brought together by lateral sutures, by passing the sutures up and down, thus making the line of suture transverse, and keeping the patient in bed, with the thighs flexed for a long time after the operation. After seeing the specimen shown by Dr. Hawkes, Dr. Lilienthal said he would be less reluctant to try the implantation method.

Dr. Kammerer said it was not unusual to get primary union in these cases. The method described was advocated by the late Dr. Phelps in the treatment of inguinal herniæ. The speaker said he had seen three or four such operations where the wounds had healed promptly, but later on intestinal suppuration had set in, and he had been obliged to remove the silver wire after several years. As Dr. Hawkes had suggested, the material used in these cases might have been at fault, and such mishaps would not occur with the silver filigree. Dr. Kammerer said that the ultimate results in some cases he had observed in which the filigree operation was done were not entirely satisfactory, and he therefore thought it was suitable only when other methods were impossible.

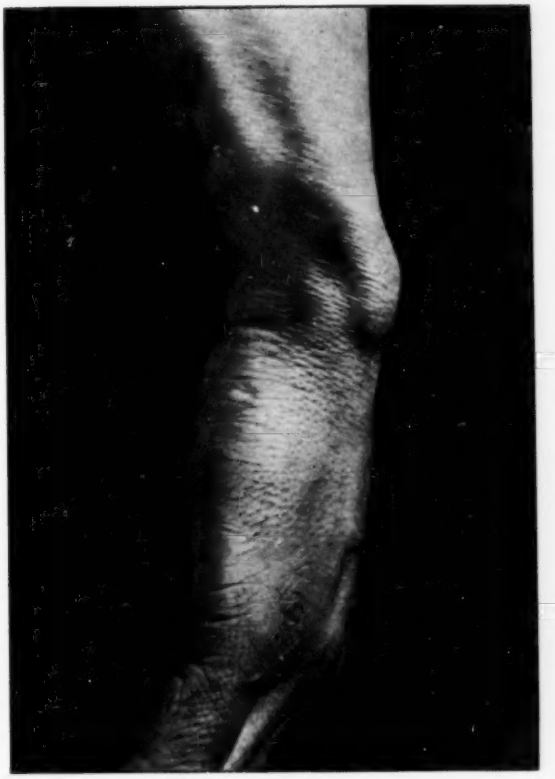


FIG. 1.—Congenital dislocation of ulna.

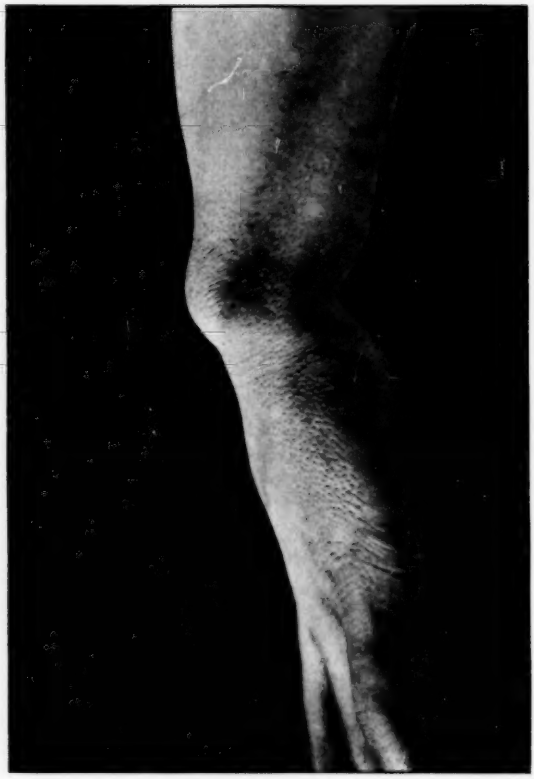


FIG. 2.—Congenital dislocation of ulna.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, April 6, 1903.

The President, RICHARD H. HARTE, M.D., in the Chair.

CONGENITAL DISLOCATION OF BOTH ULNÆ AT THE WRISTS.

DR. CHARLES F. KIEFFER reported the case of a negro man, thirty years old, by occupation a soldier, who, on presenting himself for physical examination for re-enlistment, attracted attention by the prominence of the head and styloid process of the ulna at each wrist. On examination, the left ulna was found completely displaced, overriding the dorsal surface of the carpus. The right ulna was similarly displaced, but not so completely. By strong pressure on the head of the ulna and counter-pressure on the carpus, the bone on each side could be forced a little way in the direction of its proper position. The photographs show the deformity quite well. Two radiographs also were presented,—one with the hands flat on the plate and the other with the hands on the ulnar edges, the light in both instances coming from above. The radiograph with the hands flat shows the ulna in each wrist slightly displaced outwardly. It gives no hint in either wrist of the presence or condition of the triangular fibrocartilages. The radiograph with the hands on edge is, unfortunately, not quite so clear as the first, but it shows very well how completely the ulna in both wrists is lifted above the plane of the wrist-joint.

The man says that, to the best of his knowledge, his wrists have always been as they are now. Indeed, he never suspected that there was anything unusual about them. He has been a good deal of an athlete and is a very good ball-player, showing that the deformity, as such, has produced no loss of function.

Mobility is not impaired, nor would we expect much impairment on account of the secondary part the ulna takes in the function of the wrist-joint.

This condition is very rare. What may be considered a partial development of it is sometimes encountered, where there is unusual mobility of the radio-ulnar articulation due to relaxation of the anterior and posterior radio-ulnar ligaments. In these cases the ulna slips a little bit out of place and back into place again with a click like a cracking knuckle.

A WELL-PROPORTIONED ANATOMICAL MODEL.

Dr. George McClellan showed a young man who, from an artistic stand-point, is one of the most perfectly formed men he has ever seen. For many years Dr. McClellan had endeavored to find a man possessing properly proportioned measurements, but from a study of hundreds of living and dead bodies this is the first that answers the requirements. There are so many fads in physical training that all sorts of disproportionate results are seen when men are closely examined. Sandow has developed wonderful strength, but from an artistic view is only a monstrosity. In the man exhibited, the muscles are covered by a normal amount of fat, and only come into relief when exercised, which gives the most perfect form. Dr. McClellan holds that the standard measurement is that when the distance from the top of the head to the soles is eight head-lengths, and this is the only man he has ever found that possesses exactly this measurement. The head-length is eight and one half inches and the body sixty-eight inches. Attention was called to several points showing remarkable symmetry in the various measurements of the body. Between the points of the shoulders is two head-lengths; between the trochanters, one and one-half; between the nipples, one; the trunk is two and one-half head-lengths long; the upper limbs, three; the lower limbs, four. The difficulty in finding a figure that is perfectly developed is not understood by must people, the trouble being that one part, particularly the upper or lower portion of the body, is often well developed, and the others are lacking. The famous statues made 400 to 500 B.C. are all, with possibly the exception of one,—the Resting Mercury,—made as composites.

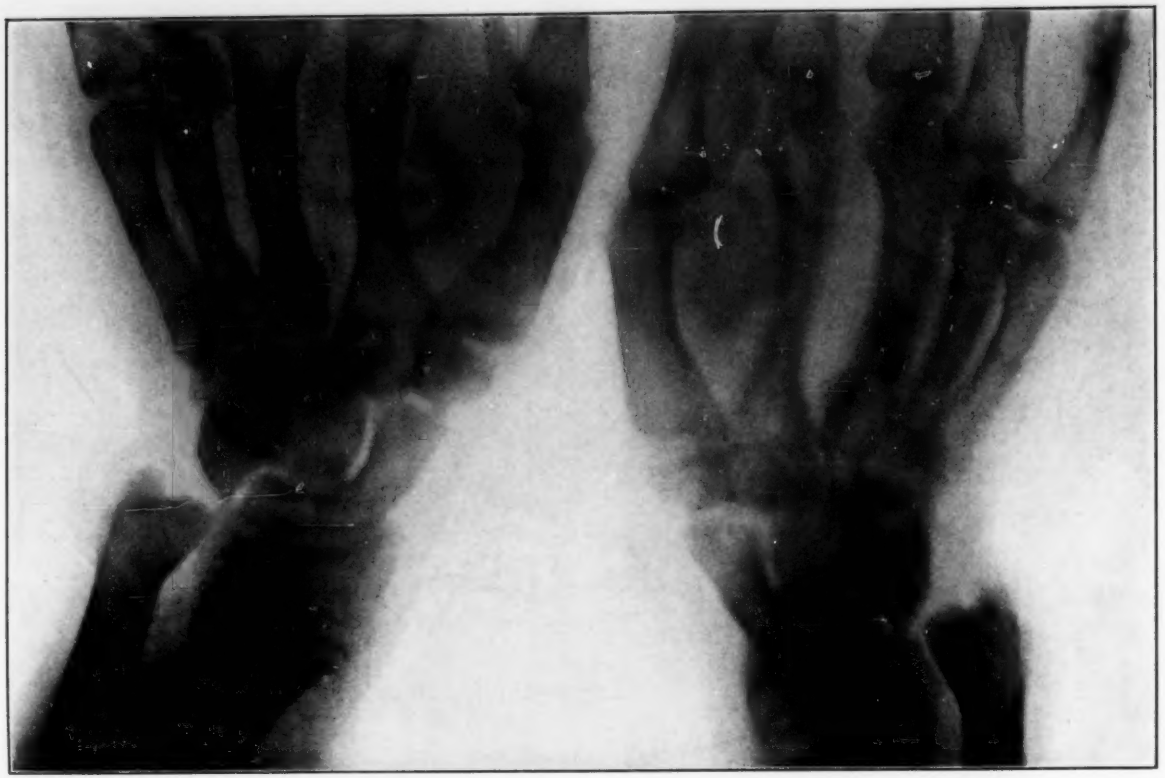


FIG. 3.—Congenital dislocation of both ulnæ; anteroposterior skiagram.

FIG. 4.—Congenital dislocation of both ulnæ; lateral skiagram.

RUPTURE OF THE LIVER AND LACERATION OF THE RIGHT KIDNEY; RECOVERY AFTER OPERATION.

DR. THOMAS R. NEILSON reported the history of a man, twenty-six years of age, who was admitted to the Episcopal Hospital on June 7, 1902. On the evening of June 4, while standing on a high step-ladder for the purpose of decorating a church, he lost his balance and fell a distance of some ten feet, striking his right side from the lower ribs to the crest of the ilium upon the arm of a pew. Immediately after the injury he was taken to his home, walking with the aid of friends. The history for the time previous to his admission to the hospital was that there was pain, especially on deep breathing, in the region of the right lower ribs; there was great accumulation of gas in the stomach, and for a time general distention of the abdomen; twice a little blood was vomited; dark-colored urine was voided naturally; there was no evacuation of the bowels, although considerable flatus was expelled.

On admission to the hospital the condition was as follows: The lips and conjunctivæ were blanched; temperature, $97^{2}/_{5}$° F.; pulse, 120, and almost imperceptible; respiration, 24 to 26; chest negative; abdomen, tenderness in upper right quadrant, with marked rigidity of the rectus muscle in that portion; tenderness in axillary line over lower ribs; liver-dulness extends two and one-fourth inches below right costal margin. Once after admission the patient vomited a small amount of blood. About an ounce of bloody urine was voided. A catheter was passed, but no more urine could be obtained. Boric acid solution was injected into the bladder and the whole amount returned clear. The leucocyte count was 12,600.

The indications of hæmorrhage were of course plain. The hæmaturia pointed to kidney injury, but the increased extent of liver-dulness, and the tenderness in the right upper abdominal region with rigidity of the upper part of the right rectus muscle, caused him to believe that the chief injury had been sustained by the liver, and accordingly operation was done with that in view.

Tincture of digitalis, ten drops, and strychnine sulphate, $^{1}/_{40}$ grain, were given hypodermically, and normal salt solution, one and three-fourths pints, was given by hypodermoclysis. The patient's condition was somewhat improved after this.

Through the right rectus, a five-inch incision was made, beginning at the costal border. On opening the peritoneum a considerable amount of dark fluid blood was found in the cavity. The peritoneal and fibrous coats of the liver were greatly distended. The parietal peritoneum in front of the upper pole of the right kidney was torn, and the kidney at this part was found to have been slightly lacerated. No fracture of the lower ribs was found.

An incision through the coverings of the liver was made, and a large amount of dark blood escaped. A considerable quantity of clots was removed by the hand, which on being passed to the posterior border of the right lobe of the liver discovered a rupture of the organ at that position. The region was flushed with hot sterile water, and the bleeding appeared to be arrested.

The patient was then turned partly on the left side, and an incision made between the eleventh and twelfth ribs of the right side just about the posterior axillary line. A long piece of iodoform gauze was then placed in a large rubber drainage tube, the latter being split lengthwise and passed into the abdominal wound, then into the wound made in the serous and fibrous coverings of the liver and brought out through the wound made between the ribs. Another piece of iodoform gauze was packed below the liver and over the upper end of the right kidney and brought out through the posterior wound. The abdominal wound was closed, except around the through-and-through gauze pack, with interrupted silkworm-gut sutures.

The patient did well after the operation, and made steady progress towards recovery. The small gauze pack was removed and replaced one week after operation, and the large one was taken out on the tenth day, being replaced by small iodoform gauze drains inserted into both the abdominal and the posterior wounds, and these were gradually dispensed with. Healing of the wounds progressed favorably.

On July 24 the patient was able to get out of bed, and on the 28th, fifty-one days after operation and fifty-four days after the injury, he was discharged recovered.

Dr. De Forest Willard said that about two years ago he had operated on a case of ruptured gall-bladder. The patient was a child who had been crushed by a wagon wheel, but, as it was not seen until two months after the injury, it was uncertain whether the liver had also been ruptured. The extravasated blood

and bile had been walled off from the peritoneal cavity, and from this cavity he had removed sixty-four ounces of almost pure bile. (*New York Medical Journal,* lxxv, 369.)

Dr. G. G. Davis related the case of a man who received a blow in the right side, which was followed by acute symptoms consisting of intense pain and abdominal rigidity. There was also dulness in the flanks. Rupture of the liver was suspected and median incision above the umbilicus was made. Blood gushed forth when the peritoneum was opened, and search revealed that it came from between the liver and diaphragm. This space was tightly packed, but the man died soon after from shock. Autopsy showed a rent four inches long in the upper surface of the liver near its ligamentous attchment.

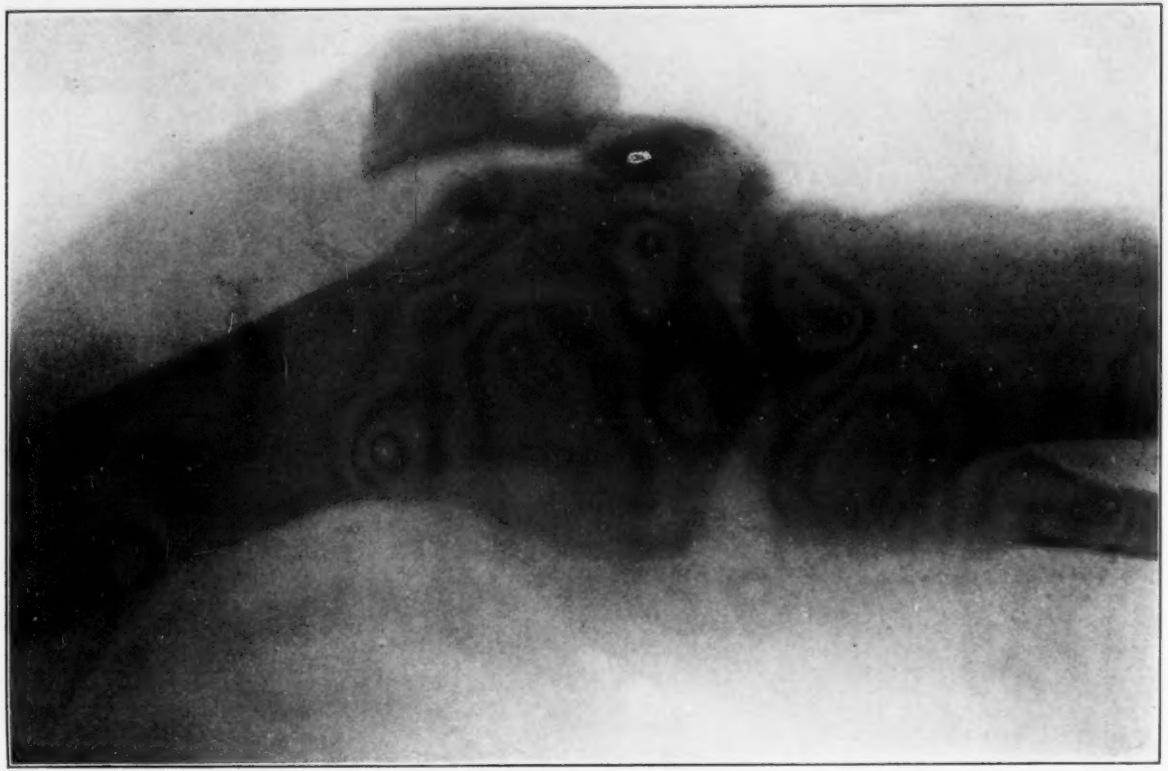
Dr. John H. Gibbon referred to a case which came under his care at the Bryn Mawr Hospital, which in many ways resembled Dr. Neilson's case, and which at first was thought to be one of rupture of the liver, but which on operation proved to be a rupture of the spleen. The patient was a boy who fell from a tree on Friday afternoon. In a short time he recovered from the immediate shock of the fall and said nothing about the injury when he arrived at home. The following morning, however, he was found very much shocked. He was admitted to the hospital on Saturday, but it was thought at this time he was too ill to be operated upon. Dr. Gibbon saw the patient first on Sunday afternoon. The patient presented every symptom of severe intra-abdominal hæmorrhage. His pallor was marked, his pulse was rapid and weak, and his respirations very much increased. Examination of the abdomen revealed no particular point of pain, tenderness, or rigidity. The abdomen was somewhat distended, with a dull percussion note in both flanks when the patient was recumbent. When the child was turned over on his side, the upper flank became resonant and the dulness of the other greatly increased. There was no evidence of confined blood in either kidney region, nor was there any tenderness here. The patient's urine showed considerable macroscopic blood on the day of admission, but this had become much less when he was seen on Sunday. There seemed little doubt that the kidney was involved in the injury, but at the same time it was clear that the abdomen contained a large amount of free blood. Although the child's condition was very bad, it was deemed wise to open the abdomen

and attempt to arrest the bleeding. In the absence of any particular indication, it was thought that the liver was the most likely organ to be lacerated, and therefore an incision was made on the right side of the abdomen below the costal border. A quantity of free blood escaped when the peritoneum was opened, but the liver and other organs on the right side were uninjured. The blood appeared to come from the opposite side of the abdomen, and therefore a second opening was made below the left costal border. The descending mesocolon and the peritoneum over the kidney were markedly injected with blood. When exploration was carried upward, clots were discovered, and later a laceration of the spleen, which admitted three fingers. The wound was firmly packed with gauze, the abdominal cavity irrigated with hot salt solution, and the wound on the right side closed. When these procedures were completed, it was found that the packing had thoroughly controlled the bleeding, and therefore it was left in position and the wound partially closed. The patient made an uneventful recovery, excepting for a slight left-sided pleurisy with some effusion, from which, however, he rapidly recovered.

REMOVAL OF A LARGE LOOSE PIECE OF BONE FROM THE KNEE-JOINT ONE YEAR AFTER BEING RUN OVER BY A FREIGHT-CAR; FUNCTIONAL RECOVERY.

Dr. H. Augustus Wilson said that he was indebted to Dr. John M. Bertolet, of Reading, for the opportunity of operating upon the case, notes of which he now gave. Dr. Bertolet's radiograph (see Fig.) clearly shows the position of the piece of bone. It is a matter of interest to record the difficulty that was experienced in interpreting this radiograph by the many surgeons who saw it. The majority expressed the opinion that it was a piece torn from the tuberosity of the tibia, the error of which was demonstrated at the time of its removal.

The patient, a man aged twenty-six years, on March 17, 1903, while on a very slowly moving freight train, attempted to step from one buffer platform to the other, in doing which he slipped. In falling, he tried to escape the wheel, but did not succeed, for it passed obliquely over his right knee. The engineer saw him fall, and instantly stopped the engine in time to prevent the second wheel also passing over him, but the right hip was severely contused by the second wheel striking against it. The



Fragment of bone in cavity of knee-joint.

trousers were badly torn at his knee, but the skin was not broken. The greatest pain was experienced at the hip. He voided bloody urine for several days, and suffered very great pain in the right hip and knee as well as in the back and left thoracic region. He was at this time in a hospital in the interior of the State, where the treatment—the exact nature of which could not be ascertained, but from the patient's account appears to have been directed principally to the right knee. He remained in the hospital for five weeks, and used crutches for three weeks after dismissal. He was again admitted, and was kept in bed for four weeks because of the severe pain in the back, knee, and hip. Until September, 1902, when he discontinued the use of crutches, he was confined to bed at irregular intervals for periods of a week or two. Not until he attempted to walk without crutches was it noticed that he was unable to fully extend or fully flex his hip and knee, and there seemed to be marked shortening, which was in a large measure due to the lack of ability to extend the leg. He was admitted to the Jefferson Medical College Hospital and operated on on March 9, 1903.

A longitudinal incision five inches in length was made from the lower edge of the patella to about the middle of the tuberosity of the tibia, and immediately upon entering the joint a hard, movable mass was encountered. Efforts at removal very quickly showed that, while apparently movable, it was firmly attached by fibrous bands to the tibia, from which it was dissected. The condyles of the femur were scrutinized, but gave no evidence of having lost any of their contour. The articulating surface of the tibia appeared normal in its anterior and outer aspect, but there seemed to be an irregularity in the posterior inner portion that led to a surmise that the piece of bone had had its origin from there. Subsequent repair had largely obliterated any cavity that may have been made at the time of the accident. The bone when removed was found to have two surfaces that were covered with cartilage and were smoothly polished as though they had been in contact with the patella and condyles of the femur. The firm attachment of the bone to the tibia and its vascularity would seem to indicate that it had formerly been much smaller, but had gradually grown to its present size, which was found to be two inches long, seven-eighths of an inch thick, and one and one-eighth of an inch wide. The wound was closed without

drainage. The stitches were removed on the sixth day. There was no temperature. Mild passive motion was instituted on the eighth day and increased daily in extent and duration. On the twelfth day he was permitted to use crutches, avoiding weight bearing upon the affected leg. On the fourteenth day he walked without crutches, with very nearly full normal flexion of the knee, but with incomplete extension. There has been no severe pain in the joint nor swelling since the operation, and on the fourteenth day he was discharged from the hospital. He was again seen two weeks later, when the function of the joint was almost complete, lacking only the ability to fully extend the knee-joint.

The very unusual amount of traumatism to which the joint was necessarily subjected in the operation of removal of the piece of bone gave rise to fear that ankylosis would follow. It was for this reason that passive motion followed by active manipulation was instituted early, and weight-bearing encouraged at an earlier period than usual in operations upon the knee-joint. It is evident that the knee-joint is sometimes capable of resisting very severe injury, and the recovery in this case from the traumatism of the accident and from the extensive operation shows that with careful technique the joint may be freely invaded without loss of function. Many writers urge that only smooth steel instruments be inserted into the joints and never the fingers, whether gloved or not, but experience in this and other cases shows that such prohibition is unnecessary. Owing to a radiographic dermatitis over the right hip, it has been found impossible to obtain a satisfactory skiagraph of the hip. The study of a very faint negative by Dr. S. A. S. Metheney at the Jefferson Medical College Hospital, and the conditions around the hip, would appear to indicate an impacted fracture of the neck of the femur with complete consolidation, but leaving a slight limitation to the function. He was able four weeks after the operation to walk and go up and down stairs with only a slight perceptible limp, without pain, and with only the fatigue that would be expected in a leg that had had so little use for a year.

Dr. Henry R. Wharton recalled a case previously reported by him in which, following a compound fracture of both bones of the leg and injury of the knee, the knee could not be completely extended. A skiagraph showed that there was a loose

mass in the joint. Several weeks later this mass was removed, and proved to be the inner condyle of the femur, which had been torn off and reversed so that the articular surface was directed upward. Good recovery followed its removal, no inversion or eversion being caused by its absence, and the man being able to walk without crutch or cane.

THREE CASES OF RECOVERY FOLLOWING OPERATION FOR PERFORATION IN TYPHOID FEVER.

DR. RICHARD H. HARTE read a paper with the above title, for which see page 63.

DR. G. G. DAVIS said that Dr. Harte need not feel chagrined over a mortality of 76 per cent. in his operations for typhoid perforation, as the mortality in these cases hinges on the character of the case rather than on the character of the operation. The importance lies not so much in operative technique as in diagnosis. The present high mortality will be lowered only when the physician and surgeon respectively are not afraid to suggest operation and to operate. Dr. Davis had operated on three cases during the past year and all died. All had general peritonitis, but the condition of each after operation was as good as it was before, hence he does not believe that operation *per se* markedly diminishes the chances of recovery. He thought formerly that inflammation of the appendix was not frequent in typhoid fever, but the number of cases he had lately seen show this to be not a rare complication. Some cases showing pain and tenderness over the appendix recovered without operation. In one case operated by Dr. Davis he found two perforations, one in the ileum and one in the appendix. The latter organ, although perforated, did not show marked inflammatory involvement, such as is found in cases of true appendicitis when the appendix alone is diseased.

DR. D. J. MILTON MILLER, who made an early diagnosis of perforation in one of Dr. Harte's successful cases, said there was at times no more difficult condition to decide upon than that of perforation in typhoid fever. There are a few signs, however, which, in a certain number of cases, enable one to make the diagnosis early. This is especially true in cases that previous to perforation have had no marked abdominal symptoms. When

the latter conditions have been present through the course of the disease, a diagnosis is very difficult to make, and is often first made in the post-mortem room. Typhoid fever patients should be watched very closely, no symptom being too trivial to be noted. The most important symptoms pointing to perforation are pain, rigidity, and increased pulse-rate. The temperature does not help us much. A rise is just as likely to occur as a fall, and distinct falls are unusual, except late in the attack, when general peritonitis or collapse is present. He had often noticed a fall of two or three degrees, but in looking back over the chart very often many similar variations could be found. The leucocyte count is unreliable. Leucocytosis is not so very uncommon in typhoid fever when there is no explanation for its occurrence. By this is meant a count of 8000 to 10,000. In one case under Dr. Miller's observation the leucocyte count was 10,000 when the patient entered the hospital. It afterwards fell slightly, and was only 9400 at the time of operation for perforation, six days after admission. Of all the symptoms pain is the most important, and the patient is usually able to fix definitely the time of its beginning. Pain during the course of typhoid fever is usually rare, and its onset of the greatest significance. Tenderness in perforation is usually localized in the lower right quadrant of the abdomen. Rigidity is usually present and comes on early. Some increase of the pulse is present in all cases. Dr. Miller does not believe in the so-called preperforative stage. The symptoms ascribed to that stage are really those of the early stage of perforation.

Dr. J. P. Hutchinson said he believed that if the records of general hospitals were examined it would be found that the majority of cases of perforation saved by operation were among those patients that came into the receiving ward and were operated on at once. Three of his successful cases were from the receiving ward, and in all there was an element of doubt as to the exact condition present. There was no difference in their condition externally from cases of perforation in hospital wards. These statements regarding receiving ward cases are based on the fact that there are different rules for visiting surgeons and visiting physicians, the latter having fairly definite visiting hours at the hospitals, the former being accustomed to go whenever they are sent for. Hence, with medical ward cases there is apt

to be some lapse of time after a change in symptoms, unless they are very pronounced, before the patient is seen by the chief. With receiving ward cases the resident surgeon perhaps makes a diagnosis, or at least sends at once for the surgeon. Most of these cases should be operated upon even if there is an element of doubt. Dr. Hutchinson has opened two cases which were doubtful and found no perforation. One was supposed to be appendicitis, but proved to be typhoid fever. In that one there was marked improvement for two days after the operation. Operation *per se* does no marked harm. In closing perforations, the longitudinal method of suturing is the better. In every case where the speaker has tried to reinforce the sutures, there has been escape of fæces.

Dr. W. L. Rodman said he coincided with Dr. Harte's statement that the incision should be made on the right side, although in his own case the median incision fortunately was made directly over the perforation. As little time as possible should be spent in the operation. The continuous suture for closing the perforation is less effective than the Lembert with packing around the area to protect in case of giving away. In doubtful cases gauze may be sutured over the wound with catgut as practised by Mayo. The diagnosis is not always easy. He operated one case which two medical men pronounced perforation, but which he thought was a case of hæmorrhage. The latter diagnosis was found to be the correct one. The patient recovered from the operation and died later from a second hæmorrhage. This case was operated upon under local anæsthesia produced by carbolic acid. No pain was experienced by the patient except when the parietal peritoneum was handled. A second case in which carbolic acid anæsthesia was used was one of strangulated hernia. No pain whatever was caused by manipulation of the intestines, but there was some, as in the first case, when the parietal peritoneum was handled. Flushing of the abdominal cavity in perforative cases is better than wiping. It saves time and more thoroughly gets rid of sepsis. The solution should be as hot as can be borne. Dr. Rodman is interested in the question of a preperforative stage. He thinks there is such a stage, but it cannot be recognized with sufficient certainty to warrant laparotomy in all instances. When so much difficulty is experienced in diagnosing perforation itself, how is the preperforative stage to be recog-

nized? In his own case he believes there was such a stage, showing itself twenty-four hours before the perforation. There is much in this suggestion of Cushing, and, if possible, the surgeon can at least get ready for operation; if there is a probability of perforation, he can operate at once under cocaine anæsthesia. He was glad to hear Dr. Harte emphasize the danger of waiting for reaction in these cases. The same rule as for gunshot wounds of the intestines should hold,—operate during shock in both instances. Perforations of the intestine and of the appendix have a different pathology, the small intestine being movable and the large more or less fixed. This same reason makes gunshot wounds of the small intestine more serious than those of the large bowel. Hence there is lessened gravity in appendiceal perforation, even during typhoid fever; there being less shock and sepsis than in typhoid perforation, when the lesion is usually in the small intestine.

Dr. J. Alison Scott believes that statistics of the time of perforation will show that in the majority of cases it occurs earlier in the course of the disease than the surgeon anticipates. He finds that many cases occur as early as the fourteenth or fifteenth day. He would explain the good results from receiving ward cases mentioned by Dr. Hutchinson by the fact that these are mild and practically walking cases. Such are in comparatively good condition and have a higher peritoneal resistance. They will get well. In cases with marked distention and pain throughout (and he finds that pain is a common symptom in typhoid), the toxæmia is great and the diagnosis of perforation is difficult. In these patients it is often impossible to make the diagnosis early. In 165 cases of typhoid under his care this winter there were three cases of perforation. All were operated upon and all died. Three things are of prime importance in diagnosis,—pain, rigidity, and tenderness. In six of eight cases of perforation coming under his knowledge pain was very sudden in onset. As a rule, it is paroxysmal. In three cases there was a chill. The temperature is of decided importance. In four of the eight cases studied it rose, fell gradually, and then rose again, the pulse meanwhile going up. Rigidity alone is not of so much importance, as it may be present in cases of pleurisy and pneumonia. The leucocyte count is not of great importance. It is usually from 4000 to 5000 in cases of typhoid, but it may jump

to 6000 or 8000 at times. A differential count, if the physician has time for it, may be of value in some instances. In the Johns Hopkins Hospital hæmorrhage with perforation has been frequently noted. Dr. Scott has not seen this combination, as in none of the cases of hæmorrhage seen by him has there been perforation; other observers have recently, however, seen the combination of the two.

Dr. R. P. McReynolds gave brief notes of four cases of perforation that he had operated upon. The first was operated upon four days after the perforation; a localized abscess had formed upon the right side; this was opened and drained. The man made a complete recovery.

The second case was operated upon about eight hours after perforation; a large opening in the bowel (the size of a twenty-five-cent piece) was found and closed. The man died some hours later.

The third case was operated upon for appendicitis, but at autopsy it was found that the cause of the general peritonitis had been a perforated typhoid ulcer.

The fourth case was operated upon about twelve hours after perforation. The diagnosis was obscured on account of severe intestinal hæmorrhages preceding the perforation. The gradual increase in the leucocytes was considered of considerable diagnostic value. The boy died about seven hours after the operation.

In these cases the incision was made in right semilunar line; chloroform used for anæsthesia. In three of them cocaine was also injected along the line of incision in order to diminish the quantity of chloroform necessary for anæsthesia.

The first case shows the possibility of a localized abscess forming after a perforation from typhoid fever ulcer, just as it does from perforation of the appendix.

Dr. Joseph M. Spellissy briefly detailed a case which he believed illustrated diagnosis in the preperforative stage. In that case there was a sudden rise of temperature, abdominal rigidity, tenderness, and pain. The leucocyte count was negative. Dr. Spellissy saw the patient two hours after the initial symptoms at the request of Dr. T. L. Coley, and agreed with the latter's diagnosis of possible perforation, and operated. Beside the symptoms detailed, there was present some bronchitis, and a

slight dulness over the left apex. Operation under ether anæsthesia revealed a patch on the intestine covered by lymph; the lymph was wiped off, but no perforation was present; although from the appearance of the ulcer it seemed imminent. The affected area was buried by means of Lembert's sutures. There was a free amount of peritoneal fluid, but it was clear. The case terminated fatally in twenty-four hours from pneumonia.

Dr. John B. Roberts said that increase in respiration was an important point. A sudden increase of respirations to 30 or 36, accompanied by pain in the abdomen, probably means perforation.

Dr. Harte, in closing, said that as regards cocaine he had never used it, but believed there was no doubt of its value in the hands of some surgeons. The time of recognition of the condition and the time of operation cannot be too close together, and but little time can be spent in making the toilet, which should be simple but thorough. One must get the patient off the table and into bed if any reasonable percentage of cases are to be saved. No one definite rule as to the manner of stitching the intestine can be followed, as this should be determined by the character of the perforation. It is less apt to tear when closed longitudinally. The leucocyte count is of no value, being only misleading in cases of perforation. Localized abscess is possible only when the lesion is associated with the appendix, as in typhoid fever the peritoneum does not have an opportunity to form well-marked collections of pus, as are noticed in other peritoneal conditions. After operation for perforation, the patient should be nourished by the bowel for a long time. As to the preperforative stage, there are no symptoms in typhoid perforation until perforation itself occurs; then the whole train of symptoms rapidly follow.

INTESTINAL PERFORATION PRODUCING PERITONITIS AND OBSTRUCTION THREE WEEKS AFTER OPERATION FOR STRANGULATED HERNIA; RESECTION OF BOWEL; RECOVERY.

Dr. John H. Gibbon reported the history of a woman, aged thirty-five years, who was admitted to the Jefferson Hospital on the night of April 1, 1901, suffering from a strangulated left femoral hernia. The symptoms of strangulation were well

marked, there being fæcal vomiting, moist skin, and a weak and rapid pulse. The hernia was large, extending for a considerable distance upward over Poupart's ligament. A curved incision was made along the upper border of the tumor with its concavity downward. The sac was opened and found to contain considerable dark-colored fluid, together with about five or six inches of very dark small intestine. The constriction was divided and healthy bowel drawn down into the wound. Hot water was then used freely for the purpose of re-establishing the circulation in the herniated bowel, and was followed by considerable improvement; but there was one portion which, although it had not lost its lustre, yet its wall was extremely thin, and at one point presented very much the sensation of an ulcer threatening perforation. This, of course, was due to pressure at the point of constriction. After considerable deliberation and the free use of hot salt solution, it was determined to restore the bowel to the abdominal cavity. The sac of the hernia was ligated and removed, and a portion of the pectineus muscle with its fascia was brought up and sutured to Poupart's ligament. The wound was closed with a subcutaneous suture of catgut and a subcuticular one of silkworm gut. The patient made an uneventful operative recovery. The postoperative condition was watched with a great deal of interest for ten days, but after that time it was thought there was little danger of any subsequent trouble from the injured bowel. On the eighteenth day, however, the patient experienced considerable pain and discomfort in the abdomen, but this was promptly relieved by an enema. She was then comfortable until the twenty-second day, when she again had the same pain and discomfort. The enema was repeated, but the result was not as satisfactory as on the former occasion. To the symptoms of pain and discomfort were soon added those of vomiting, slight distention, more marked on the left than on the right side, and a pulse ranging between 120 and 130. At this time there was entire absence of fever. The abdomen was then opened. As the pain was located on both sides, a median incision was made a little below the umbilicus. On incising the peritoneum, there escaped a thick, light-colored fluid, and when the hand was introduced it discovered a mass of adherent intestine on the right side. This was delivered, and more fluid escaped from the abdominal cavity. The adherent bowel was then separated and about one ounce of

thick pus escaped. The portion of bowel which had been herniated was bent upon itself, and the mesentery belonging to another portion was adherent to it, and between these two structures the pus was located. When they were further separated, a perforation of considerable size was found at the site of the former constriction. As a large portion of the bowel was deprived of its peritoneal coat in the process of separating the adhesions, it was determined that resection of the diseased portion of the bowel and end-to-end anastomosis would be the best treatment. This was accomplished without difficulty with the aid of the O'Hara forceps. Three rows of sutures were employed,—the first of silk and the last two of catgut. The portion of bowel removed measured about eight inches. A large portion of the intestine was covered by flakes of lymph, and the pelvic cavity was found to contain considerable fluid of a dirty color. The entire small intestine was drawn out of the abdominal cavity and all of the deposits of lymph were carefully wiped away with gauze sponges, and the abdominal and pelvic cavities thoroughly and for a long time irrigated with warm, normal salt solution. The intestine was then returned to the abdomen and the wound closed, except for a small space in its centre, through which a gauze drain was passed down to the seat of anastomosis. The patient was considerably shocked by the operation, and not only required hypodermic and rectal stimulation, but also the use of the intravenous injection of salt solution. During the night following the operation the patient vomited at frequent intervals. The rectal tube was introduced repeatedly and considerable fæcal matter and flatus passed through it. The next day the patient was much better, and from this time on made a rapid recovery. She was heard from within the past few months, when she had had no recurrence of the hernia and no symptoms of obstruction.

Dr. Gibbon recalled the fact that Dr. T. S. K. Morton reported before this Academy in May, 1901 (ANNALS OF SURGERY, Vol. xxxiv, 1901, p. 318), the case of a woman upon whom he operated for a strangulated femoral hernia, who developed marked symptoms of obstruction of the bowel several weeks later. The abdomen was opened and the bowel resected, the patient making a good recovery. The obstruction in this case was entirely due to adhesion of the bowel.

In the *Lancet* of April 27, 1901, Barker reports a case in

which he resected thirty-seven inches of small intestine four months subsequent to an operation for strangulated hernia. In this case, at the time of operation, the strangulated bowel was not gangrenous, although considerably congested. Subsequently the patient suffered from two attacks of severe obstruction. At the time of the second operation there was found extensive adhesion of the intestine, with nearly complete obstruction of its caliber due to a kink. The patient made a good recovery.

Both of these cases differ from the case reported by Dr. Gibbon in the important respect that there were no abscess, no perforation, and no peritonitis present in either; but nevertheless they all illustrate the occasional necessity for opening an abdomen for obstruction a number of weeks after operation for strangulated hernia.

He added that while it was not his purpose to discuss the immediate treatment of the bowel in strangulated hernia, he desired to say, however, that it was his own practice, when the circumstances permitted of it, always to operate at once upon cases of strangulated hernia and never to employ taxis. He was also of opinion that when there is great doubt as to the vitality of the bowel, the surgeon will display better judgment by doing an immediate resection than by restoring the bowel, temporarily fixing it in the wound, or performing an artificial anus. Of course, cases which are moribund are not included in this statement.

The point which each of the three cases already quoted emphasized was that, when symptoms of obstruction of peritonitis develop after an operation for strangulated hernia, immediate opening of the abdomen is demanded. Delay at such a time is disastrous, and early operation gives wonderfully good results, even under the most discouraging circumstances.

Dr. Francis T. Stewart briefly reported two cases of intestinal resection. One followed a previous operation, by another surgeon, for strangulated inguinal hernia in which resection had been performed. The obstruction necessitating the second resection in this case was caused by a diaphragm made by the O'Hara forceps, which was used in the first operation. This patient died. The second patient is now convalescing from a resection made necessary by the results of an ovariectomy performed some months before. Obstruction was due to a kink in the bowel. A perforation was found at the site of kinking. This

was sutured and the abdomen closed. In three weeks symptoms of obstruction again developed due to the formation of a stricture at the point of suturing. The stricture was resected without mechanical aid.

DR. GIBBON, in closing, said that the first case referred to by Dr. Stewart was one that he had operated upon, the obstruction being due to a diaphragm following the use of the O'Hara forceps. He has entirely given up the use of these forceps and unites the intestines without mechanical aid.

INDEX TO SURGICAL PROGRESS.

HEAD.

I. Empyema of the Sphenoid and Intracranial Complications. By Dr. Kander (Carlsruhe). To account for the obscure cases of meningitis, sufficient cognizance is not taken of the accessory cavities of the nose, and particularly does this obtain with the sphenoidal sinus and its relation to the cavernous sinus.

While the number of reported cases of empyema of the sphenoidal sinus is very small, yet this is not in accord with post-mortem findings. Thus, Wertheim found in 360 cadavers empyema of the sphenoidal sinus thirty-five times. The etiological factors in every instance were one of the acute or chronic infectious diseases; in the first place, particularly pneumonia, scarlet fever, and diphtheria. Tuberculosis markedly predisposes to sinus disease. It was not to be ascertained whether the infection spread from an acute rhinitis or whether it started anew in the sinus itself.

Three personal experiences are recounted, the first in a female afflicted with pneumonia. On the tenth day, in addition to severe cerebral symptoms, there were pain and rigidity in the neck, œdema of the lids and half of the face; diminished vision. The papilla of the optic nerve was hazy and the veins distended, and when finally exophthalmos set in, the diagnosis of thrombosis of the cavernous sinus was only too evident. The pneumonic infiltration persisted to the end. Operation was refused. The rhinoscopic examination had shown nothing, but the post-mortem revealed a bilateral empyema of the sphenoidal sinuses, thrombophlebitis of the lateral sinus, and purulent meningitis.

The second patient, a male, with a decided family history of tuberculosis and personally afflicted with " catarrh of the apex,"

had a severe coryza for four weeks, associated with a free discharge of pus from the right half of the nose. Suddenly rigidity of the neck set in with high fever, congestion of the right eyelids and bulb, with profuse lachrymation. A marked protrusion of the bulb was perceptible. Rhinoscopy showed deviation of the septum to the right; hypertrophy and tumefaction of the middle turbinated with free pus in the middle meatus of the right side. Patient otherwise markedly septic and great tenderness upon percussion of the frontal bone. This latter sign determined the diagnosis as frontal sinusitis. An operation for the relief of this failed to find the cause, and the patient's condition did not warrant search for the pus in the sphenoidal sinus, which was then suspected. Post-mortem examination brought to light a basilar meningitis; a collection of pus in the sella turcica; the right sinus cavernosa thrombosed, a perforation of the sphenoidal sinus itself containing pus.

In the third instance a bullet lodged in the sphenoidal sinus had caused suppurative signs.

The thrombophlebitis is brought about either by contiguity of inflammation of the bone to the cavernous sinus or infection is carried by the emissary veins, or finally by the lymph channels. Abscesses were always extradural.

The diagnosis is determined by the severe frontal headaches and rhinoscopic findings, and, when the cavernous sinus is thrombosed, by the additional disturbance in the ocular circulation. Where the conditions warrant it, the middle turbinated bone may be resected to aid in establishing the diagnosis.

Operation.—A resection and dilatation of the ostium may establish sufficient drainage, and if not, the frontal sinus is opened and through it the sphenoidal sinus can be reached. The posterior wall of the frontal sinus is removed and the endeavor made to locate extradural collections of pus.—*Beiträge zur klinischen Chirurgie,* Band xxxvi., Heft 1.

MARTIN W. WARE (New York).

ABDOMEN.

I. The Question of Drainage after Abdominal Operations. By PROFESSOR R. OLSHAUSEN. Olshausen gives his reasons for practically abandoning drainage after abdominal operations, and compares his results with those of operators who disagree with him. In the last twenty years the author has only used tampons for hæmostasis or drainage five times. Operators, as a rule, use the tampon to prevent general peritonitis after the removal of infectious foci under the following circumstances:

(1) If during operation pus has escaped into the belly cavity.

(2) If remnants of tumors or abscess membrane are left *in situ*.

(3) In cases of penetrating injuries to the gut or bladder.

(4) If material has escaped into the belly cavity of a nature to form a good culture medium.

During the past six years the author has performed 1555 laparotomies, of which 114 (7½ per cent.) were severe, and in none did he drain.

The death-rate was higher than it ought to have been because of accidents (embolism, perforation of stomach), and yet was no greater than that of surgeons, *e.g.*, Schauta, who drain.

The only real danger is in cases of recent peritonitis with multiple suppurative lesions, and in those of intestinal injuries. The history after operations in pus cases (generally pyosalpinx) was often one without fever or reaction. The gonococci in tubal pus are relatively harmless and lose their virulence when the disease has lasted nine to twelve months. Microbes which wander from the intestines, in cases of ovarian abscess and suppurating tumors, are more malignant. The most malignant organisms are the streptococci seen in peritonitis and recent injuries.

The author thinks we may discard the four indications for drainage already given. Drainage does not lower the primary mortality, because it neither protects against infection nor does

it remove it. The infection is usually generalized before drainage is begun.

On the other hand, drainage involves danger from secondary infection. Apart from thorough sepsis and recognition of indications, the principal means of safety is the dry technique and elevation of the pelvis. The peritoneum and neighboring organs must be carefully protected. Foci of pus must be carefully removed intact. If such are opened, the pus must be completely removed with gauze pads. The peritoneum, and especially Douglas's pouch, must be carefully cleaned and left dry. Perforations of gut or bladder must at once be closed by a double line of sutures, and, if possible, covered by neighboring serosa. If the bladder is sutured, permanent catheterization must be kept up for a week. Douching the peritoneum is dangerous and useless. The author completely closes the belly after all his operations, with the following exceptions: He packs cases where there is uncontrollable hæmorrhage from surfaces and drains perityphlitic abscesses, because in these cases there is liable to be a renewed secretion of very virulent matter. In doubtful cases of deep-seated pelvic suppuration in women, vaginal drainage is more reasonable than suprapubic. Zweifel records 140 cases of pyosalpinx operated on without drainage, and with only one death.—*Zeitschrift für Geburtshülfe und Gynäkologie,* lxviii, Heft 2.

II. Operative Treatment of Acute Infectious Cholecystitis. By Dr. Körte (Berlin). Körte has operated 135 times for suppurative inflammation of the gall-bladder and ducts. In seventeen of these the operation was demanded during the attack of acute infectious cholecystitis, when stones were found in sixteen. In seven cases the gall-stones were latent, in five the troubles they occasioned were diagnosed wrong (gastronephritic colic or perityphlitis), in four the gall-stone colic was correctly diagnosed. The acute infectious cholecystitis began suddenly with chill and fever. Körte believes that closure of the cystic duct

formed a closed infected cavity, led to increased virulence of the bacteria and to increased tension, and thus to necrosis and peritonitis. Twice the acute cholecystitis supervened on a strangulation of gut in a hernia. Peritoneal infection manifested itself twice by the presence of turbid serous fluid, once by pus. The symptoms of peritonitis dominated the cases. Removal of the gall-bladder and flushing of the peritoneum led to recovery. In threatened perforation from necrosis of a portion of gut, Körte obtained protection by the use of omentum.

Like Riedel, the author found in these acute cases that the gall-bladder was inflamed, thickened, and its serosa overlaid with exudate. Abscesses might exist in the wall or between the bladder and liver. The mucosa was always softened, ulcerated by stone pressure. Spontaneous cure is possible, but improbable. The dangers from sepsis, suppuration of liver, and peritonitis are so great that operation is obligatory; the more so as even in the acute stage, on the second to the ninth day of the disease, general infection of the peritoneum may be prevented. Of seventeen patients three died, and these from complications, viz., two from myocarditis and nephritis and one from diabetes. In no case was there infection of the peritoneum (general (?)).

Körte has become a warm advocate of operation in the acute stage, and has himself performed cystotomy with drainage six times, resection with drainage and tamponade five times, and cystectomy with hepaticus drainage six times. The last operation is highly commended because it removes the focus of disease, discloses abscesses of the liver, and prevents stones being left behind.—*Versammlung deutscher Naturforscher und Aerzte, Sektion für Chirurgie,* 1902; *Centralblatt für Chirurgie,* November 29, 1902.

JOHN F. BINNIE (Kansas City).

III. Seven Hundred and Twenty Laparotomies for Gall-Stones. By HANS KEHR (Halberstadt). Kehr's first operation

was performed in 1890, and since that time he has performed 720 operations upon 655 patients. In order to comprehend this subject, he warmly urges the study of the pathology of this affection. This can best be done during operations. He believes that calculi *per se* cause no symptoms. It is only after infection has been added that their presence manifests itself. In 80 to 90 per cent. of his cases jaundice was absent in cases where calculi were lodged in the gall-bladder or cystic duct. Even in common duct stones it was absent in over one-third. Small stones as well as those which attain the size of a walnut remain latent for weeks and even months in the common duct. Both the colic and jaundice are to be ascribed to inflammatory changes in the majority of cases of gall-stones.

A palpable tumor in the region of the gall-bladder is only present in acute, rarely in chronic cases.

Nature's attempts to cure the disease spontaneously are not always the best. He found fistulæ between the alimentary canal and gall-bladder in thirty cases, and in a number of these an ascending infection had occurred. A cure of a case of gall-stones through internal medication seldom occurs. In those cases where such a cure was supposed to have occurred, there had simply been a transition to a latent stage. The Carlsbad waters can create such a quiescent condition.

It is possible to make an exact anatomical diagnosis from the physical findings, the history, and careful observation.

We must be able to determine the location of the calculi and differentiate cholecystitis from cholangeitis, circumscribed pericholecystitis from diffuse peritonitis. In cases of chronic closure of the common duct one must be able to distinguish stones from tumors as the cause. In the majority of his cases he is now able to make a special diagnosis.

To be able to form indications for and against operation is another step in advance. He does not operate on every case which he examines. The presence of calculi is not of as great

value as an indication for operation as their sequelæ, for example, inflammation and common duct closure.

In 90 per cent. of the cases of chronic closure of the common bile-duct the stones were too large to have ever been able to pass through the papilla.

He considers operation indicated in acute seropurulent cholecystitis. It is less dangerous than an expectant treatment, if only the pus is evacuated and then the stones removed at a subsequent sitting. His conclusions are:

1. He believes that the medical treatment produces a latent condition in many cases, and in some even a cure.

2. Riedel's dictum to remove the stones as soon as discovered holds now as well as in the past, for it protects against many of the dangerous sequelæ of gall-stones (perforation, cholæmia, carcinoma). Such an early operation cannot always be done in practice, hence Riedel's advice is of little practical value.

3. If the attacks are mild and there is complete latency between them, he advises against an operation.

4. Acute closure of common duct is with but few exceptions to be treated medically. If the symptoms of cholangeitis become prominent, and the icterus is accompanied by emaciation and anorexia for some time, an operation is to be considered.

5. Frequent colics without icterus or passage of stones, if they cause invalidism, are an indication for operation.

6. Cases of icterus with passage of stones during each attack are an indication for medical treatment, but if they are very frequent and the patient seems to be failing, and there is no prospect of all the stones being passed, he would operate.

7. Hydrops and empyema of the gall-bladder as well as pericholecystic suppuration are in the province of the surgeon.

8. Chronic closure of the common duct should not be allowed to exist too long if a Carlsbad cure has been of no avail.

9. Patients with gall-stones who have become victims of

morphine should be operated under all circumstances. During the after-treatment the morphine habit can be cured.

10. Only early operations are of any benefit in carcinoma of the gall-bladder, and these are seldom operated upon early.

11. Patients with chronic icterus, which are not dependent upon a stone in the common duct or incurable diseases of the liver, should be operated upon within three months at the latest, since one will often find a chronic interstitial pancreatitis instead of a suspected carcinoma of the head of the pancreas.

12. Both patient and surgeon will be more easily influenced to operate when a gall-bladder tumefaction, an enlarged liver, jaundice, and fever are present. But even in the absence of local findings, the continuance of severe symptoms is an indication *per se*. One often finds in such cases adhesions without stone.

13. The sequelæ of gall-stones, such as suppurative angiocholitis, abscess of the liver, perforative peritonitis, subphrenic abscess, severe pyloric and duodenal stenoses as well as ileus due to gall-stones all demand surgical interference.

14. Every case is a unit in itself. Obese patients do not bear operations well. Chronic nephritis, diabetes, arteriosclerosis, pulmonary and cardiac diseases are a contraindication to operation.

Kehr has performed 720 laparotomies upon 655 patients,—536 of these were women, 119 men. An interesting fact in the table accompanying the article is that of the first 360 operations the majority were cholecystostomies. In the last 360 cases cholecystectomy and drainage of the hepatic duct predominate. Biliary fistulæ no longer follow operations. It may be necessary at times to have temporary drainage of the gall-bladder, but a permanent fistula can be avoided.

In the first 360 cases, 54 per cent. were cholecystostomies; 20 per cent. cholecystectomies; 13 per cent. choledochotomies, and 1 per cent. hepatic duct drainage.

In the last 360 cases there were only 20 per cent. cholecys-

tostomies; 64 per cent. cholecystectomies; 6 per cent. choledochotomies, and 41 per cent. hepatic duct drainages. From this can be deduced that Kehr has

1. Become more radical in his operations.

2. Operated more severe and advanced cases in the last four years.

3. That he restricts the early operations more than formerly.

He prefers cystostomy for all acute processes. In interval operations he believes that the gall-bladder should be extirpated. In removing stones from the common duct, drainage is to be preferred to suture. On account of the fact that stones may remain latent both in the common and hepatic ducts, he has made it a rule in the past year to drain the hepatic duct, and thus avoid recurrence. The mortality of cholecystectomy with hepatic duct drainage is not over 2 to 3 per cent. Adhesions around the neck of the gall-bladder can give rise to the same symptoms as gall-stones. To avoid recurrence in these cases, it is best to extirpate the gall-bladder.

About 10 per cent. of the cases which consult a surgeon have carcinoma. Such patients have no symptoms until the tumor is palpable, and then operation is of no avail. Such a carcinoma is often associated with an empyema of the gall-bladder. In 274 cholecystectomies it was only necessary to reopen the abdomen in one case. At times it is necessary to leave artery forceps *in situ* on account of the inaccessibility of the deeper vessels.

Twelve per cent. of the cases were complicated by gastric affections, principally a stenosis, for which he warmly recommends gastro-enterostomy in preference to other methods (pyloroplasty). In fifteen cases the diseased appendix was removed. He recommends examining the appendix in every case. He makes it a rule to palpate the pancreas, and in case of a diseased organ prefers an anastomosis of the stomach and gall-bladder to any other operation. He anchors the liver (hepatopexy), if hepatoptosis is present, in order to obliterate the subphrenic space.

In 720 laparotomies for gall-stones, his mortality was 15.5 per cent. If one excludes complicating operations such as gastro-enterostomy and hopeless cases such as carcinomata and cholangeitis, the mortality would only be 3.5 per cent.

Cholecystostomy was followed by 2.1 per cent., cholecystectomy by 3.1 per cent., and drainage of the common and hepatic ducts by 6.5 per cent. mortality. During the past two years he has lost only 2 per cent. of the common duct cases, owing to more rapid technique, which he considers absolutely essential in this operation. Cholecystectomy is only 1 per cent. more dangerous than cholecystotomy, and has the advantage of being more radical.

If the gall-stone operations are complicated by gastro-enterostomy, the mortality rises to 21 per cent. If complicated by inoperable carcinoma or cholangeitis, the mortality is 97 per cent. Even the 3 per cent. recoveries in these cases justify operation. The average mortality of uncomplicated cases of gall-stones is not more than 2 per cent.

The danger of hæmorrhage is reduced by the use of chloride of calcium. He formerly taught that patients over sixty should not be operated, but he now believes that this is no objection. Similarly chronic icterus due to closure of common duct is no objection, because in many cases a chronic interstitial pancreatitis is thus relieved, as Mayo Robson has shown. He advocates the combination of drainage of hepatic duct with cholecystectomy as the normal method. He opens the common duct in its supra-duodenal portion, and then inserts a drainage tube a distance of about two inches into the hepatic duct, and the entire bile is led to the surface for about fourteen days, without interfering with digestion in the least. This procedure is much less difficult than a suture of the common duct and not so apt to overlook stones.

He places gauze tampons around the tube leading to the hepatic duct. He has never observed fistula or stenosis or ascending cholangeitis following hepatic duct drainage.

One is less apt to have recurrences with radical operations. He has never observed a genuine recurrence. Frequently stones are overlooked or colics due to adhesions follow operations. This is far less likely if the gall-bladder is extirpated.—*Münchener medicinische Wochenschrift,* Nos. 41, 42, and 43, 1902.

DANIEL N. EISENDRATH (Chicago).

IV. Injuries of the Spleen and Liver. By H. ROESER (Carlsruhe). The injuries of the spleen are classified by the author as laceration of the capsule, subcapsular hæmatoma, and rupture of the spleen, any one of which may be accompanied by injury to other abdominal or thoracic viscera.

For the lesser injuries, sutures deeply passed into the parenchyma may control the bleeding, or the Pacquelin cautery or vaporization. Where the laceration is extensive, extirpation must be practised. Of 135 ruptured spleens, 104 died; ninety without operation. Of thirty subjected to the operation of extirpation, sixteen recovered,—53 per cent.

The consequences of splenectomy are a transient diminution of the red blood-cells, increase of the leucocytes. The thyroid is not vicariously enlarged. The lymph nodes and the bone marrow show increased hæmatogenic properties. There is a diminution of the hæmoglobin. Splenectomy is followed by no permanent lesions.

A median laparotomy is favored as the best route to gain access to the spleen. A saline intravenous infusion should precede the operative interference. The vessels of the hilum should be separately tied, and preferably with silk, to guard against slipping. Two cases are narrated of subcutaneous rupture of the spleen for which splenectomy was practised.

For injuries of the liver, suture remains as the best procedure to control hæmorrhage. Catgut and wholly rounded needles had best be employed. The suture should embrace a wide extent of liver substance. If the laceration be very extensive,

tamponade is to be practised. The Pacquelin cautery is only of service in slight parenchymatous hæmorrhages and vaporization likewise. If the large veins be injured, they should be sutured. Injury to the biliary passage should be sought for and remedied by suture, if possible.—*Beiträge zur klinischen Chirurgie,* Band xxxvi, Heft 1.

V. Transpleural Laparotomy for Stab Wounds of the Spleen. By Dr. F. Shaefer (Strasburg). Subsequent to a penetrating wound of the abdomen, we may decide that intra-abdominal hæmorrhage is at hand, but we can only presume from the locality of the wound inflicted that the spleen has been affected. Yet, two observers, Fevrier and Trendelenburg, have directed attention to a tetanic condition of the abdomen extending to the cremaster muscle, thus drawing up the scrotum and the penis. Trendelenburg attributes this tetanic condition of the abdomen to the chemical as well as the mechanical irritation of the blood upon the peritoneum. This sign is by no means always present, and only derives significance in the presence of an acute anæmia. As to dulness, this is a more valuable yet erratic sign, since the blood may gather in the omental bursa, or, if the diaphragm has been injured, the respiratory movements of the lung may aspirate the blood into the pleural cavity. Thus there will be intermissions in the hæmorrhages, and the secondary hæmorrhages will only prove fatal after the lapse of days.

Seventy-one open wounds of the spleen are analyzed; twenty were operated and recovered. Of fifty-one not operated, one recovered. Hence the dictum, every penetrating wound of the spleen is a strict indication for an operation.

Statistics show that in a great majority of the cases the route of the wound is *via* the thorax, and furthermore that wounds of the spleen are complicated with wounds of other organs. In stab and gunshot wounds coming from the left side, the pleural cavity and diaphragm are injured.

If the external wound be in the abdominal region and access to the spleen and diaphragm is difficult, then the dread of occasioning an acute pneumothorax is not to be taken seriously into consideration in choosing the transpleural route; and if the external wound overlies the lower thoracic wall, a transpleural laparotomy is all the more so indicated. It consists in a section of several ribs, and then making these ribs hinge at their cartilaginous junction. The advantage of such a transpleural flap is the better access thus afforded to the upper lateral parts of the abdomen and the greater facility obtained in treating the injury to the diaphragm. This is the contention of surgeons who have taken this route to attack the injured spleen. A weakening of the abdominal wall is thus avoided; the chest wall suffers no more than is experienced in resection for empyema. The dangers of pneumothorax are overestimated, since many patients are already in this condition; and even were they not, the dangers arising from peritonitis setting in are greater than those of pneumothorax.—*Beiträge zur klinischen Chirurgie,* Band xxxvi, Heft 1.

MARTIN W. WARE (New York).

EXTREMITIES.

I. Hard, Traumatic Œdema of the Dorsum of the Hand and Foot. By DR. VULLIET, Lausanne. The disease is more frequent in the hand than the foot.

1. Etiology. Usually a well localized blow on the back of the hand (not necessarily severe); more rarely dorsal flexion of the hand.

2. Symptoms. During the first days after the trauma, diffuse swelling of the dorsum of hand or foot, most marked at the base of the fingers or toes. At the height of the disease, the swelling is hard, elastic; no pitting on pressure. The skin cannot be pinched up in folds. There are no signs of inflammation and no ecchymosis. Here and there crepitation may be noted. The ball of the thumb is normal. Skiagraphs show the bones un-

injured. Pressure is painful; active and passive movements of the fingers are hindered, are often very painful (especially when over-extended); the thumb is always unaffected.

3. Course and termination. For a time the swelling remains unchanged, then subsides slowly in the course of eight to twelve weeks, though it often persists longer, in which case one notices either a hard, well-defined nodule or a diffuse induration on the bones. These indurations are rarely permanent, and remind one of a fracture or chronic inflammation. While the hand can be used before the swelling has entirely disappeared, yet work is not recommended while any swelling persists.

4. Pathogenesis. In the absence of direct anatomic investigation, it is assumed that the condition is one of fibrous, diffuse exudation, which is slowly absorbed and in places is organized.

5. Differential diagnosis. Inflammatory œdema resulting from infection presents marked symptoms; it is soft, red, shows a source of infection, and causing glandular swellings. The œdema from circulatory disturbances is also soft. Fractures of the metacarpal bones give more localized symptoms, have ecchymoses; the duration of the swelling is not so long and callus forms. Skiascopy completes the diagnosis. Effusions of blood always show ecchymoses, which are never seen in "hard œdema."

The diagnosis may become difficult when the hard, diffuse œdema persists longer than usual, or, if persistent, indurations or nodules form on the metacarpal bones.

6. The treatment consists in warm baths. Massage seems to do more harm than good. Elastic pressure has no influence.—*Centralblatt für Chirurgie*, 1902, No. 43.

JOHN F. BINNIE (Kansas City).

II. Tenoplasty in the Treatment of Flat-foot. By PROFESSOR DR. ERNST MÜLLER (Stuttgart). Flat-foot has been treated by numerous methods of operating on tendons: Shortening of the tibialis posticus (Hoffa, Francke), union of the tibialis

anticus to the under surface of the first metatarsus (Francke), transplantations of a part of the tendo Achillis into that of the tibialis posticus (Nicoladoni, etc.). The author gives a new method, and recommends it highly. His method consists in the separation of the tendon of the tibialis anticus from its insertion and its union to a canal in the navicular bone. He has done the operation thirteen times on seven patients. The *modus operandi* is as follows: Curved incision along the margin of the arch of the foot, beginning behind and below the internal malleolus midway between this and the sole, and ending anterior to the base of the first metatarsal. Find the insertion of the tibialis anticus tendon in the anterior angle of the wound, divide it and isolate it up to the region of the ankle. Expose the lower surface of the arch of the foot for the space of one centimetre outward, and with a trephine the size of a lead-pencil bore a hole through the navicular bone from below upward and somewhat backward. Pull the tendon through this hole by means of a thread. Press the arch of the foot upward as far as possible, pull the tendon strongly downward, and, slinging round the inner margin of the navicular bone, fix it there to the bone by means of wire sutures. The arch of the foot will be held up by the tendon as if by a bridle. Apply a plaster dressing for four weeks, then use massage to the leg and passive movements; soon careful rising movements may be practised; but the "flat-foot sole" must be used until the muscles become sufficiently strong. As a preliminary step in the operation, the tendo Achillis ought to be divided, otherwise it will be impossible to push the arch up high enough in supinated feet. The author considers the condition of the tendo Achillis very important in flat-foot, its contraction being sufficient to cause the trouble in some cases, and he has divided it with good effect. If the tendon is too short, there cannot be sufficient extension in the talocrural joint to permit the foot assuming a right or acute angle with the leg; but if this takes place during walking or standing, then the weight of the body elevates the anterior part

of the foot and causes plantar flexion of the posterior part, thus causing flat-foot. The tenoplasty as above described is specially indicated in those cases of flat-foot where the tendon of the tibialis anticus stands out as a cord. This sign is usually described merely in cases of contracted flat-foot where there is a spastic condition of the muscle, but it may very frequently be seen in mobile flat-foot, where its presence may be indicated by pigmentation of the skin over the course of the tendon.—*Centralblatt für Chirurgie*, January 10, 1903, page 40.

JOHN F. BINNIE (Kansas City).

REVIEWS OF BOOKS.

THE SURGICAL DISEASES OF THE GENITO-URINARY ORGANS. By E. L. KEYES, A.M., M.D., LL.D., Consulting Surgeon to Bellevue Hospital, etc., and E. L. KEYES, JR., A.B., M.D., Ph.D., Lecturer on Genito-Urinary Surgery, New York Polyclinic School and Hospital, etc. Pp. 827. D. Appleton & Co., 1903.

"Van Buren and Keyes" has so long been a standard authority that every physician has more or less acquaintance with at least the outlines of the book. But a new generation of practitioners has come since the edition of 1888, and changes have taken place in surgery and medicine to such an extent that the present work is to all intents and purposes new.

The plan of the book is more distinctly surgical and less venereal than the previous edition. Syphilis and the sexual disturbances are mentioned, but not treated of at any length; although a generous space is devoted to gonorrhœa, as the cause of so many genito-urinary troubles; and even its more remote manifestations and complications are considered with much detail. Some fine colored plates are inserted illustrating the gonococcus and the method of differentiating the true from the false micro-organism. In passing, a word of praise is due the many excellent illustrations with which the book abounds. It is not feasible to more than indicate a few of the many excellences of the work, for a review must be rather a taste than a full meal.

Such important subjects as urethritis, cystitis, vesiculitis, inflammations of the epididymis and testicle and other allied conditions are considered thoroughly and authoritatively. The same may be said of vesical calculi. Litholapaxy, however, which many surgeons have relegated to oblivion, is described at length and heartily advocated.

The chapters on the surgery of the kidneys and ureters are full, plain, conservative, and thorough. The causes of floating kidney are considered in detail, and Einhorn is quoted in substantiation of the statement that gastric symptoms are not due to the prolapse. Nevertheless, several observers have recently called attention to the fold of peritoneum which passes from the right kidney to the pylorus and upper duodenum, and which undoubtedly drags upon those structures when the kidney descends. Such traction must of necessity exert some harmful action on the digestive apparatus.

We approach with something more than passing interest the section dealing with surgical diseases of the prostate, and especially the radical treatment of obstructive hypertrophy, for this subject, requiring as it does so ripened a judgment, and being influenced by so many factors, is dealt with differently by almost every surgeon. Laying aside all comment on when to operate, and taking into consideration only the method to be employed, we find a marked preference on the author's part for Chetwood's perineal galvanocaustic operation, which is essentially Bottini's, but performed through a perineal incision with a specially modified instrument. It would seem that the objections urged against Bottini's operation might fairly be urged against Chetwood's. The removal of tissue by burning, and waiting for the slow separation of sloughs with subsequent shrinkage, carries one back to the days of Ambroise Paré and his revolt against the cautery. Further, the lowering of tissue vitality by burning, in an area already teeming with pathogenic bacteria, seems to invite infection. Again, the perineum is perforce incised in this operation. Why not be a bit more generous, enlarge the incision sufficiently to *see*, and then with knife, scissors, forceps, and fingers enucleate the prostatic tissue, and accomplish at once what cauterization may altogether fail of? Perineal prostatectomy presents all the advantages claimed for other methods, and, above and beyond everything, it is simple, surgical, and sufficient.

Among many other excellent features there should be emphasized a diagnostic table in which penile chancre, chancroid, herpes, and simple ulcerated abrasions are compared in parallel columns. It should be very helpful in many cases of obscure origin.

Page 187 assures us that "some are born with stricture; . . . some acquire stricture; . . . and, alas! many have stricture thrust upon them!" May we hint a doubt as to whether Malvolio would altogether enjoy the paraphrase of his famous soliloquy? And is "laboratorially" permissible? On the whole, however, a book which carries so strongly the impress of its authors' personality and is withal so broad and fair minded deserves more than ordinary commendation.

HENRY GOODWIN WEBSTER.

SURGICAL DISEASES OF THE KIDNEY AND URETER, including Injuries, Malformations, and Misplacements. By HENRY MORRIS, M.A., M.D. (Lond.), F.R.C.S. Two volumes, 8vo, 600 pages each. Chicago, Ill.: W. T. Keener & Co.

These two volumes are to be considered as an extension and elaboration of Mr. Morris's original manual on "Surgical Diseases of the Kidney," published in 1884. Since 1884 renal and ureteral surgery have developed to a remarkable degree, and the author, with increasing interest, has kept pace with the advance, adding to his own experience, and studying zealously the work of others.

The scope of the two volumes is defined in the preface, and embraces a systematic account (1) of the regional anatomy, the malformations and misplacements, and the injuries and surgical diseases of the kidney and of the ureter; (2) of the affections of the perinephric and the peri-ureteral tissue; and (3) of the surgical treatment of these several conditions as recommended and practised at the present time by those most occupied in this branch of surgery.

Volume I is entirely devoted to the kidney. In discussing the

clinical examination of the kidney, Mr. Morris is not enthusiastic over the methods at present in vogue. The X-ray he holds as unreliable, shadows being cast when no calculus exists, and *vice versa*. He does not place much reliance on cryoscopy, and gives rather a wider margin than most authors, stating that when the freezing point of urine is below 0.9° C. renal insufficiency is indicated. Other observers, however, have established the standard between 1° and 2° C. as the index of renal sufficiency. The methylene blue test he considers as unreliable, since certain hepatic and nervous disorders as well as conpensatory hypertrophies of the renal parenchyma affect it considerably. The phloridzin test is mentioned, but the author does not express any opinion as to its usefulness.

Each chapter is introduced by a short history of the subject to be considered, and reference is made to the principal memoirs on the subject. An exhaustive bibliography, however, is not given.

The chapter on movable kidney is very instructive. Its pathology is thoroughly discussed and the associated phenomena are explained. Nephropexy as a means of cure he likens to the operation for the radical cure of hernia. It is especially indicated, he states, where pain and gastro-intestinal symptoms predominate. In cases of renal crises, nephropexy is strongly urged. When complicated with hysteria and neurasthenia, the results are doubtful.

The subject of the treatment of hæmorrhage from an injured kidney is presented in an exhaustive *résumé* of the subject, and cannot fail to impress the reader with the thoroughness and conservatism with which Mr. Morris attacks the consideration of interference in renal disease. He accepts the statistics with caution. He says in part: "The argument is, I think, fallacious which assumes that the cases which have been operated upon are the most severe, and those not operated upon are the slighter injuries; and so also is the conclusion that if many of those

treated palliatively had been operated upon, the mortality would have been very materially further reduced."

In considering the pathology of the various diseases, his description is most complete, and presents all of the various pathologic forms which the disease may assume.

Volume II consists of two parts,—Part I being a continuation of his treatise on renal surgery, while Part II is devoted entirely to the surgical diseases of the ureter.

The various methods of examining the ureter are taken up in Chapter III of the second part. Palpation, inspection, and catheterization of the ureter are discussed at length.

Mr. Morris takes issue with most of the enthusiasts on ureteral catheterization. His objections are: 1. The obnoxious nature of the operation in the female, and the extreme difficulty of it in the male. 2. The unreliableness of the information it affords. 3. The risks to which it exposes the patient. 4. The disadvantages of it as a mode of treatment.

All of his teachings are founded upon sound and scientific surgical principles, and the two volumes cover well the entire field of renal and ureteral surgery.

PAUL MONROE PILCHER.

REGIONAL MINOR SURGERY. By GEORGE GRAY VAN SCHAICK, M.D., Attending Surgeon to the French Hospital, New York. New York: Published by the International Journal of Surgery Co.

This little volume deals with minor surgical emergencies and diseases, the treatment of which usually falls to the lot of the general practitioner.

The principles embodied are thoroughly sound and modern and the result of an extensive experience in both hospital and private practice.

The opening chapters are given to the consideration of asepsis, dressing, and the suturing of wounds. Then each region of

the body is in turn considered, and the injuries and diseases to which it may be subject are described with special reference to the various methods of treatment which may be employed.

The chapters on the affections of the hand and fingers is particularly comprehensive. The writer well states in the preface that "minor surgery is minor in name only," and that much of this class of surgical work is in the hands of the general practitioner, "who will be judged more often by his results with an injured finger than by those which he achieves with so much arduous labor in internal medicine and obstetrics."

In the reading of this little book one cannot fail to get many new and useful ideas. There are numerous good illustrations, and, on the whole, it serves admirably the purpose for which it is intended.

WALTER A. SHERWOOD.

THE ELEMENTS OF PATHOLOGICAL ANATOMY AND HISTOLOGY. By WALTER SYDNEY LAZARUS-BARLOW, B.A., B.C., M.D. (Camb.), F.R.C.P. (Lond.). Philadelphia: P. Blakiston's Son & Co., 1903.

The work is primarily a text-book, and aims to place before the student a treatise in which the typical pathological lesions are emphasized, rather than the sub-varieties.

The author's view as to illustrations is certainly the correct one, for he claims that a student needs special training to properly interpret microphotographs, while accurate drawings are of much greater value, since they depict more clearly the existing conditions. The drawings of microscopic sections have been faithfully executed and are a distinct feature of the book. The same criticism cannot apply to the illustrations of gross sections; and it is believed that actual photographs could be used to better advantage.

The author does not delve deeply into the various theories of pathologic change, but states simply the most generally accepted facts.

The subject-matter is well arranged, introducing in the first part the general pathological anatomy and histology of the tissues, and then taking up in the second part the pathological anatomy and histology of the special organs and tissues.

The author expresses himself clearly and concisely, and in addition possesses a style which holds the interest of the student, at the same time emphasizing the essential features.

PAUL MONROE PILCHER.

THE AMERICAN YEAR-BOOK OF MEDICINE AND SURGERY. Surgical Volume, 1903. Under the general editorial charge of GEORGE M. GOULD, M.D. Philadelphia: W. B. Saunders, 1903.

The title-page of each issue of the "Year-Book" presents changes in the personnel of its editing staff; changes that remind us that some eminent contemporary has completed his scientific work among us, or that one must limit his hours of labor as "sunset days" replace the time of ceaseless activity and enthusiasm. As ever, Dr. Gould exhibits excellent scientific judgment in the selections of new collaborators, and the work goes on increasing in size and in importance. The "local flavor," remarked some years ago in review, persists and becomes more decided. In theory this is not wise editorially, scientifically, or commercially. *The* American Year-Book should number among its editors men of eminence from *every* important *American* medical centre (New York, Philadelphia, Boston, Brooklyn, Ann Arbor, Baltimore, Washington, Chicago, Cleveland, Buffalo, New Orleans, Denver, San Francisco, Montreal, and Toronto). The editorial spices synthetically formed by the combination (and competition) of literary geniuses widely distributed would add zest and vigor to the product. The multiplicity of points of view would enlarge its scope. The commercial advantages of such a policy are clear.

In the volume before us the surgical section has been enlarged to 339 pages. It seems more complete than any of its

predecessors, although its recapitulations are brief enough. Work on surgical technique is clearly abstracted. The paragraphs on tetanus are of great interest. There are many reviews of writings dealing with studies of tumors. These studies are based largely on clinical observations. Gastric and enteric surgery, operations upon herniæ, and recent acquisitions to our knowledge of appendicitis are treated at length. Extensive surgical work in the cranial cavity is reported. Taking the section as a whole, it is very satisfactory. In the section on obstetrics, we find a discussion of the midwives question on the first pages. This is followed by some startling disclosures regarding the increasing sterility among American women. Then are recorded case reports, clinical observations, and descriptions of new methods in profusion. Dystocia has been the theme of many writers here reviewed. The year's gynæcological literature is well presented, although, from the excessive proportion of foreign works mentioned, we would deduct that many American writings have been passed unnoticed. Brief and concise are the offerings of the orthopædists. There is little of interest in the section devoted to the eye. The logical merging of the departments given to the ear, nose, and throat is ventured for the first time in this volume. The pages on anatomy are more numerous than in past years. The index is a good one. Illustrations seem proportionately fewer than before. This is surprising when the art is advancing so rapidly. The increasing frequency and improvement in execution of illustrations is a beautiful feature of most modern scientific literature.

CHARLES H. GOODRICH.